Coolcentric™
Making Data Centers Sustainable

Cooling Distribution Unit

INSTALLATION GUIDE

Models: CD150W4
CD150W3

Coolcentric, a Division of Vette Corp
201 Boston Post Road West, Marlborough, MA 01752
Email: info@coolcentric.com Website: www.coolcentric.com

ABOUT THIS DOCUMENT

Using This Document

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GENERAL STATEMENT

Product Standards

Products installed and operated in accordance with instructions, conform to the EMC directive and essential Health & Safety requirements of the Machinery Directive 91/368/EEC-93/44/EEC & 93/68/EEC. This includes the EMC compatibility directive 89/336/EEC. As standard, units comply with an IP21 rating.
The products are UL listed and certificates will be made available on application to the address on the front cover.

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SAFETY INSRUCTIONS

Section 1

IMPORTANT NOTICE

ALL PERSONNEL involved in the installation and maintenance of the Process and Ancillary Equipment, whether directly or indirectly, **MUST** read this notice and this complete document prior to the commencement of **ANY WORK**.

1. The following information must be **READ, FULLY UNDERSTOOD** and **ADHERED** to **AT ALL TIMES**.
2. The **SAFETY** of **YOU** and **OTHER PERSONS MUST** be your main concern.
3. **NEVER** carry out a task until you fully understand what you are being asked to do and how to do it safely.
4. **NEVER** carry out a task you feel could be **DANGEROUS** to you and other persons.
5. **DO NOT** carry out any task that you are not qualified to undertake.
6. **ALWAYS** comply with all **SAFETY RULES** as laid down by the relevant Authorities.
7. If you have any questions or concerns over the safety of **YOU** or **OTHER PERSONS** you **MUST** consult your supervisor within the Company prior to the commencement of any task.
8. **NEVER** start work on a unit or remove any casings, guards, doors or covers without first **SWITCHING OFF** and isolating the unit and controllers from the electrical supply.
9. Make sure all **ROTATING PARTS ARE AT REST** before commencement of any work on the unit.
10. The Safety Policy of the Company on whose premises the unit is installed should be read and understood by Maintenance Personnel.

ALWAYS THINK SAFETY

Throughout this guide, items of importance are highlighted with the following symbols:

CAUTION: Failure to comply may result in damage to the unit

DANGER: Failure to comply may result in personnel injury

SAFETY INSTRUCTIONS (continued)

General

Temperature control equipment presents mechanical, electrical, noise or vibration hazards. Observe all safety, installation, operation and maintenance instructions.

Installation, servicing and operation of the equipment can only be carried out by fully trained and technically competent personnel.

The Cooling Distribution Unit is designed to minimize mechanical and electrical hazards by fully restricting access through unit casings, doors and covers while equipment is operational.

Some installations may require additional protective features to prevent accidental contact with components. The CDU manufacturer can provide advice and make recommendations for additional protection to suit the application.

All installation work must be completed in accordance with the safety, installation, operation and maintenance instructions and the unit correctly grounded (earthed) before it is operated.

Prior to any maintenance work being carried out, ensure that:

Equipment is switched OFF

Equipment and controls are disconnected from the electrical supply.

All rotating parts have come to rest.

If in any doubt as to the correct interpretation of performing the safety, installation, operation and maintenance instructions, it is essential that the CDU manufacturer, their agent or appointed distributor is consulted for advice and clarification.

1.1 Installation / Handling

The installation and operation should be conducted in accordance with local regulations and accepted codes of good practice.

When moving or lifting the unit, caution must be observed at all times to ensure the safety of all personnel. Only appropriate and approved lifting equipment must be used.

1.2 Application

The unit must be only used in the application for which it was designed.

The unit is not to be used in a hazardous environment unless it has been specially designed and approved for such application.

1.3 Warranty

Failure to comply with the manufacturer's installation instructions could affect the reliability and performance of the unit and invalidate the warranty.

Warranty is subject to the implementation of a planned service/maintenance agreement - see the warranty section (Section 11) in this guide or the sales contract.

1.4 Electrical Connection

The unit must be connected to an external isolator/disconnect if one is not fitted to the unit.

Electrical connections should be carried out in accordance with national and local regulations.

Never make any connections in the unit circuits unless the electricity supply has been switched OFF at the disconnect (isolator).

1.5 Maintenance

For further information, please refer to Section 7 – Preventative and General Maintenance.

1.6 Service Parts

Service parts must be of the same specification as those being renewed and should only be obtained from the CDU manufacturer.

The use of incorrect service parts can affect the unit operation and reliability and invalidate any warranty.

1.7 Codes of Practice

It is important that equipment and products which have been installed and commissioned are maintained by or under supervision of technical competent personnel and that all work is carried out in accordance with good engineering practice and strict adherence to:

i. IEE & IEEE Standards
ii. Codes of good engineering practice
iii. Local Authorities
iv. Statutory requirements
v. Manufacturer's instructions and recommendations
vi. All other relevant information, regulations and legislation

1.8 Waste disposal

Waste materials must be disposed of in a professional and responsible manner and in strict adherence to environmental regulations. For details, consult local environmental agencies.

1.9 Documentation

All documentation must remain with the unit at all times.

INTRODUCTION

Section 2

2.1 General

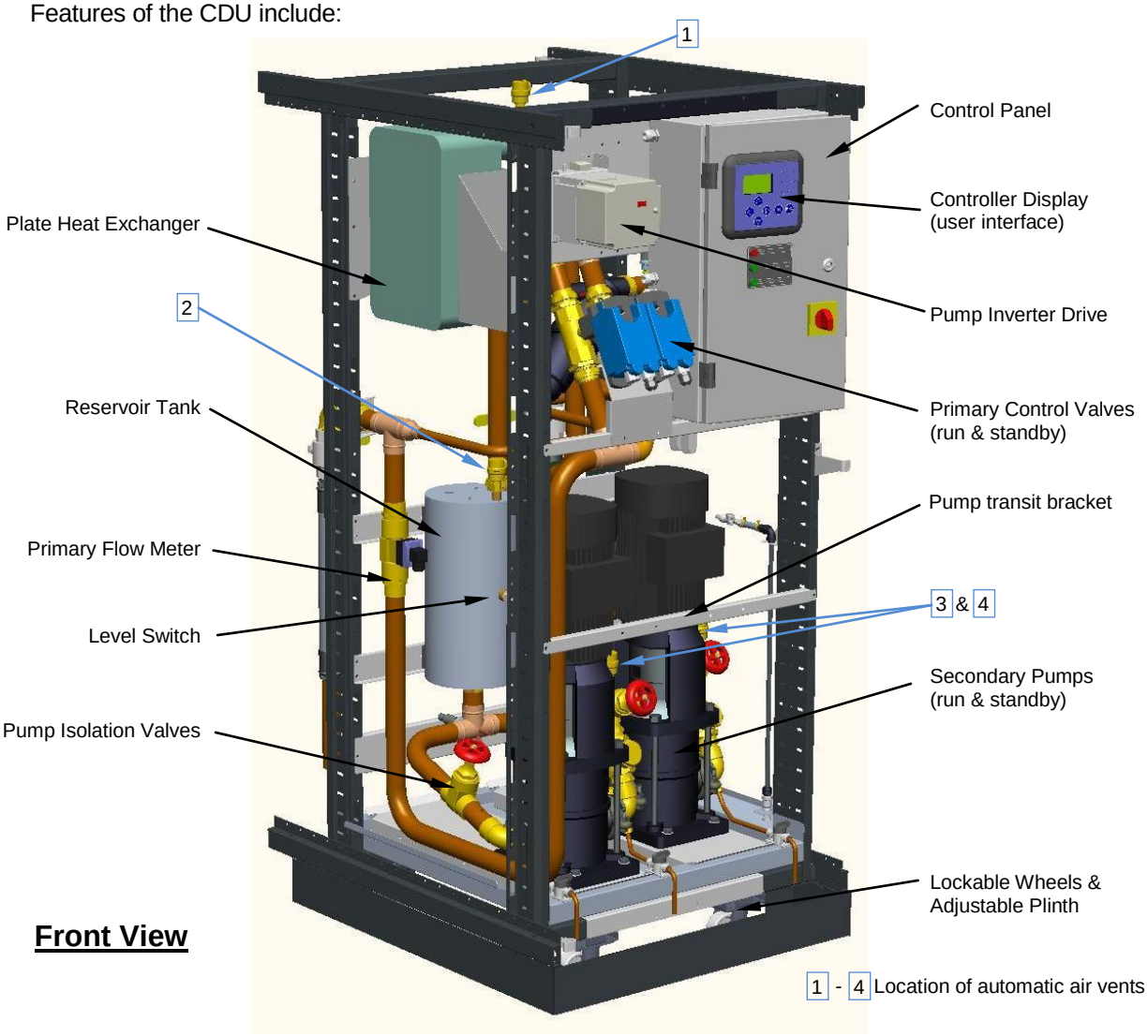
This guide describes the basic Installation, Operation and Maintenance of the Cooling Distribution Unit (CDU) and contains a detailed explanation covering the Technical Specification, Mode of Operation, description of the alarms that can be generated and the action to be taken at those alarms, a Spare Parts List and all relevant Schematic Diagrams.

It is assumed that the people involved with the maintenance of this unit are familiar with basic theory and practice. Consequently only features that are of particular significance to this unit are identified.

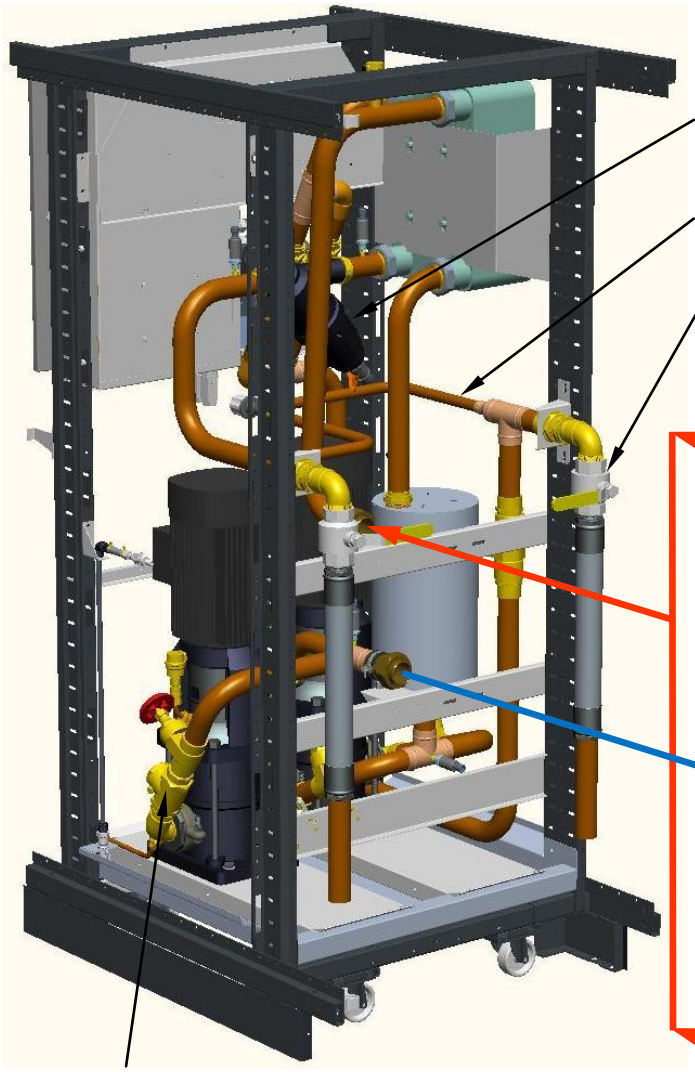
The CDU has been designed to provide close controlled cooling water for IT enclosure 'Rear Door Heat Exchangers' (RDHx's), with a total maximum cooling capacity of 120 or 150kW.

The process side water loop (referred to as the 'Secondary Circuit') is a sealed pressurized system with the heat extracted from the rear door heat exchangers being rejected to a chilled water circuit.
The chilled water can either be part of the Building Services Chilled Water system or supplied from a dedicated chiller or cooling tower. This chilled water supply loop (referred to as the 'Primary Circuit') is filtered to 300µ (50mesh) using a filtration unit fitted internally to the cabinet.

Features of the CDU include:



INTRODUCTION (continued)



Primary Filter

Primary By-pass Circuit

Primary Isolation Valves

Secondary Return Quick Release Couplings

Internal manifold option

Secondary Supply Quick Release Couplings

Secondary Hose Clips

Optional Secondary Flow Control/Balancing Valves

Secondary Pump Non-Return Valve

Cone seat union couplings

Flex Tails option for external manifold

Rear View
(with optional Internal Manifold or Flex Tails for external Manifold)

TECHNICAL DATA

Section 3

3.1 Physical

Model:	CD120W4	CD150W4	CD120W3	CD150W3
Cabinet dimensions: Width Height Depth	800mm (31½") 1825mm (71⅞") 1085mm (42¾")			
Shipping dimensions: Width Height Depth	940mm (37") 1985mm (78⅛") 1220mm (48")			
Weight (inc. manifold): Dry Operational Shipping	398kg (877½lb) 441.5kg (973½lb) 540kg (1190lb)	407kg (897½lb) 454.5kg (897½lb) 549kg (1210½lb)	398kg (877½lb) 441.5kg (973½lb) 540kg (1190lb)	407kg (897½lb) 454.5kg (897½lb) 549kg (1210½lb)

3.2 Pipe Connections

Secondary Circuit:	3/4" ISO-B QRC* or 42mm/1½" sweat
Primary Circuit:	42mm/1½" sweat

*QRC = Quick Release Coupling (self sealing)

3.3 Electrical Connection *(see also Section 4.2)*

Power Supply 3ph + ground (earth):	380-480V 50/60Hz	208-230V 50/60Hz
Full Load Amps:	7.3A@400V / 6.7A@480V	11.8@208V
Typ. Power Consumption:	2.6kW	
Max. Installed Load	5.6kVA	

3.4 CDU Fluid Capacity

Secondary Circuit Volume:	32L (8.45USgall)	33.5L (8.85USgall)	32L (8.45USgall)	33.5L (8.85USgall)
Primary Circuit Volume:	10L (2.64USgall)	11.5L (3.04USgall)	10L (2.64USgall)	11.5L (3.04USgall)

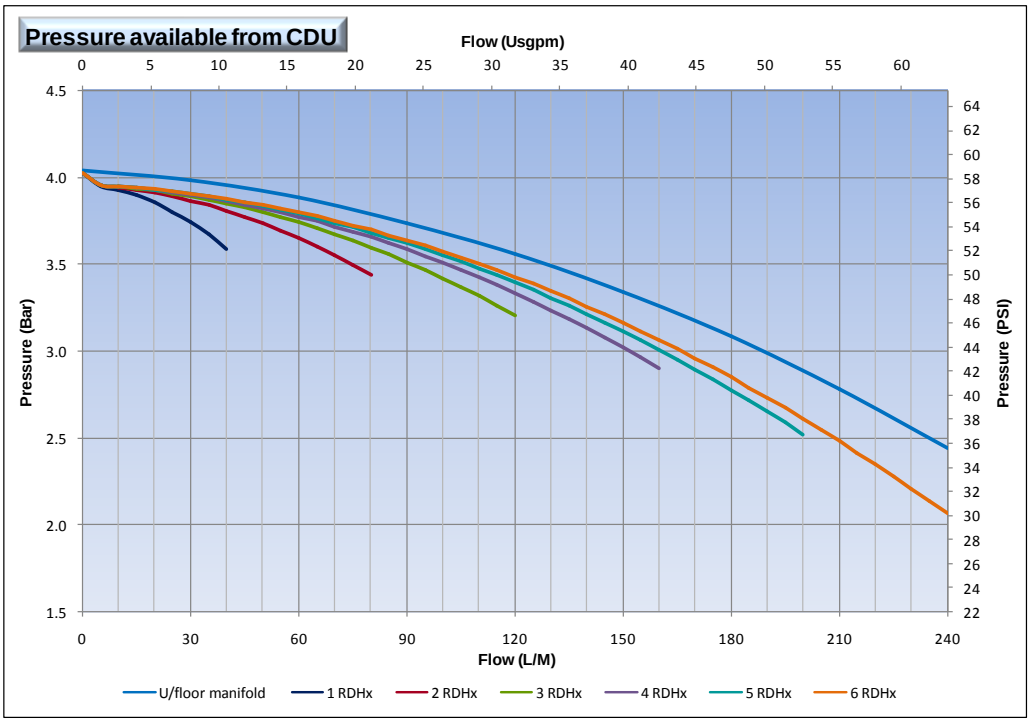
3.5 Noise

Sound power level at 3m/10ft	Less than 55dBA

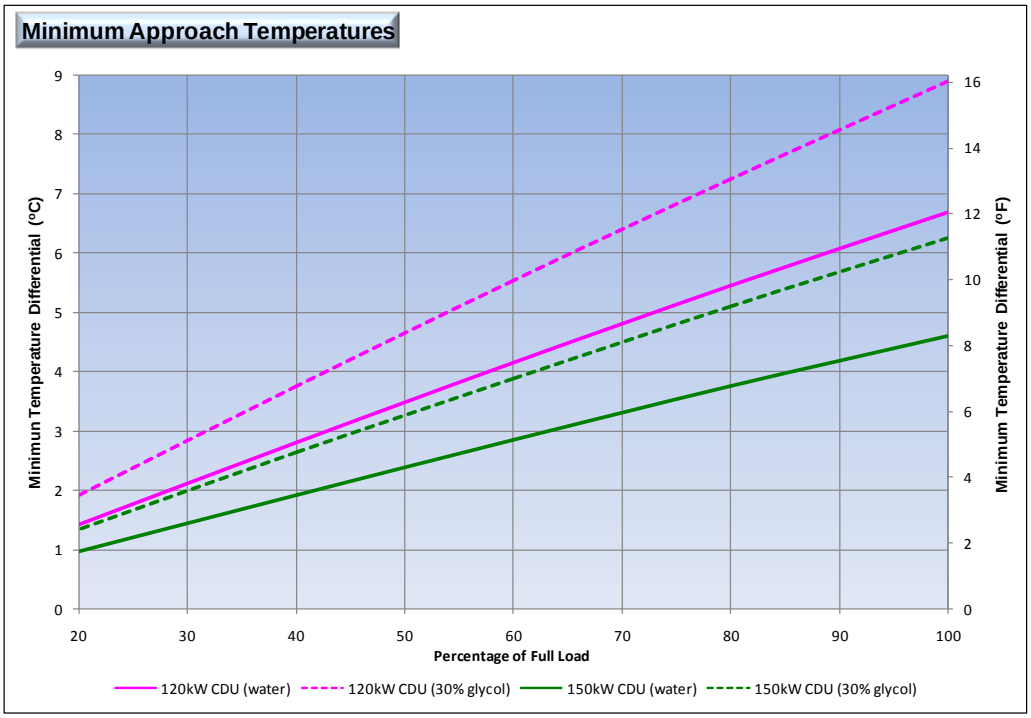
3.6 Secondary Circuit

Rated Cooling Capacity	120kW	150kW	120kW	150kW
Pump Capacity	240l/m (63.4USgpm)			

TECHNICAL DATA (continued)



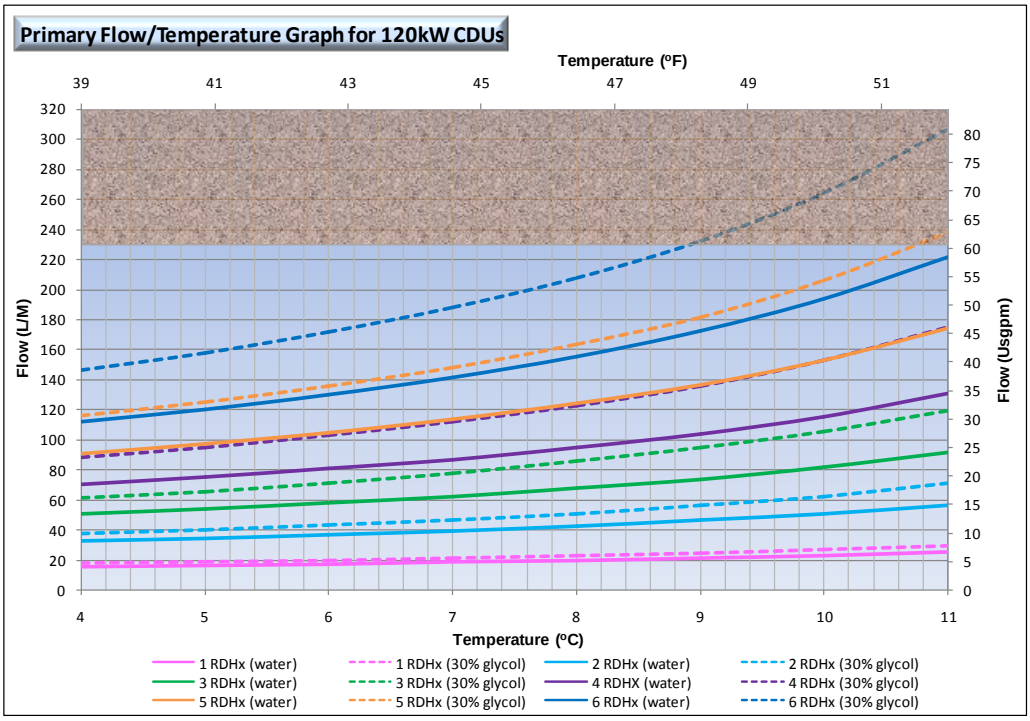
The above graph shows the available pressure differential at the secondary supply and return connections of the CDU. Curves labelled 1 to 6 RDHx are with the internal manifold fitted for 1 to 6 external circuits. These curves also take into account the pressure drop through the self sealing, quick release couplings. The curve labelled U/F Manifold is with flexible tails fitted for direct connection to an under floor installed manifold system (see page 8).



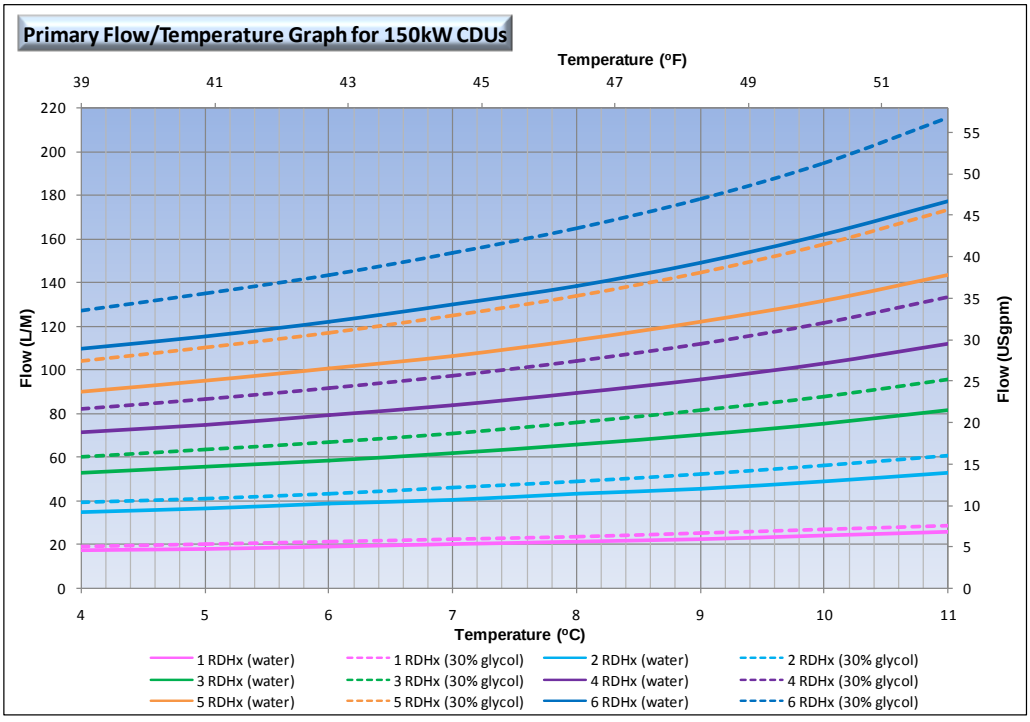
The above graph shows the minimum temperature differential possible between the Primary chilled water supply temperature the Secondary set point temperature for the percentage of full CDU rated load. Graph data based around full primary flow of 230L/M (60.8USgpm) and secondary flow of 240L/M (63.4USgpm).

TECHNICAL DATA (continued)

3.7 Primary Circuit



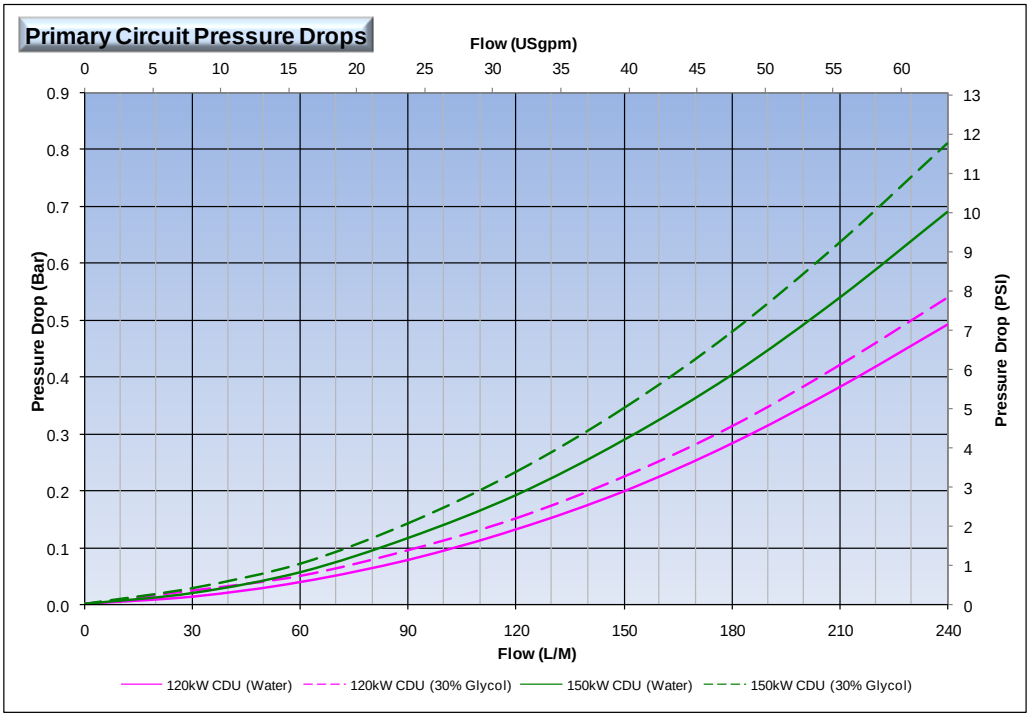
Note: To keep pipe velocities within limits, it is recommended that the brown shaded area is avoided.



The graphs above are a guide for the primary water requirements, based on the number of RDHx's connected for either plain water or up to 30% ethylene glycol (different % of glycol can be estimated on a pro-rata basis). The primary water should fall either on the chosen curve or in the area above the curve.
Note: The water flow should not be more than 20% above the recommended value for stable control.

Both the graphs are based around a secondary supply temperature of 18°C (64.4°F) to achieve the full duty of 20kW per RDHx for the 120kW CDU & 25kW per RDHx for the 150kW CDU.

TECHNICAL DATA (continued)



The graph above shows the maximum pressure drops through the CDU cabinets for both plain water and water with 30% glycol.

INSTALLATION

Section 4

4.1 Mechanical

Arrival on site: The CDU cabinet is crated and dispatched on a load bearing pallet. On arrival at site the top and side panels of the crate and the protective bubble wrap should be removed and the cabinet inspected for any transit damage. If damage is found, it must be reported to the manufacturer immediately.
The cabinet can be wheeled off the pallet using the crate front as a ramp, or may be removed using a forklift, which can then be used to transport the unit to its final destination. The cabinet must be kept within 15° of vertical at all times.
Note: Care should be taken when using a forklift or pallet truck to avoid damaging the drain/sump point under the middle/front of the unit.

The CDU cabinet is intended for positioning on a smooth and level floor, ideally a raised with at least 300mm (12") under floor space for hose runs to data rack RDHx's. For ease of positioning, the unit is supplied with load bearing wheels. Sufficient space should be allowed at the front and rear of the unit to fully open the access doors, i.e. in excess of 800mm (31½"). Once in position the corner plinths supplied loose with the cabinet may be bolted to the underside of the cabinet as shown in Fig.1 and the unit then raised & levelled with the levelling feet. Plinth covers are also supplied for front and sides (but not the back to keep area clear for hose runs).
The keys for front & rear doors are supplied in a bag secured to the front door.

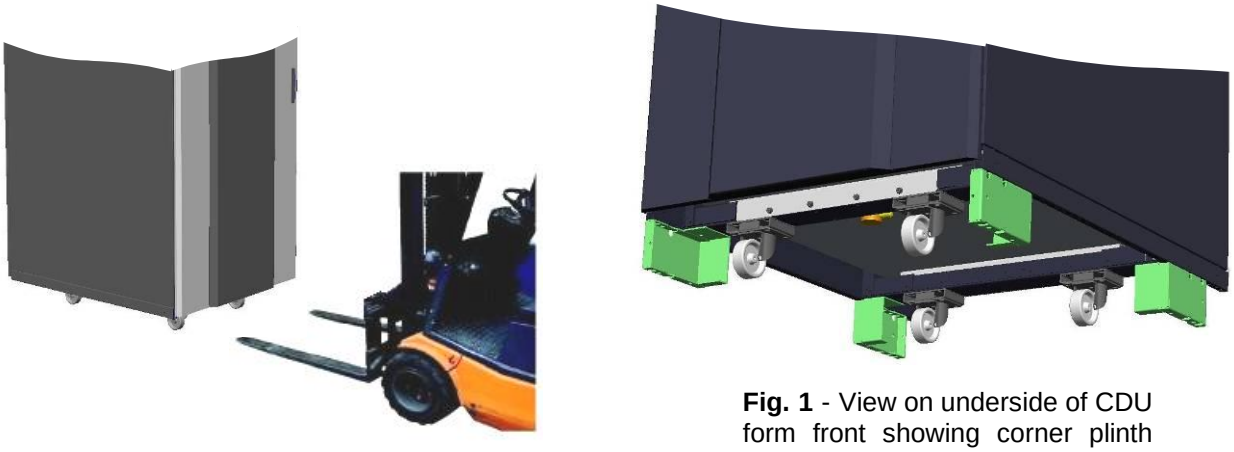


Fig. 1 - View on underside of CDU form front showing corner plinth positions (shown in green).

4.2 Electrical

A 25mm (1") cable gland is provided in the underside of the electrical box to accept a 9-17mm (⅜"-⅝") diameter power cable. The incoming cable may be routed into the cabinet either via the floor void or through the cabinet roof panel. Termination point is at the main electrical box disconnect (isolator) and adjacent ground (earth) terminal. Recommended cable size is 4-core 2.5mm^2 (13AWG) minimum. Upstream protection must be provided by the end user as stipulated on the wiring diagram in the form of fuses.

Note: The CD120W4 & CD150W4 units are supplied configured for 380-415v 3-phase supply as standard. If the supply voltage is higher (e.g. 460-480v), then the 400v wire tapping on the control transformer should be moved to the 460v tapping (see Fig.2) and the thermal overloads reset for 5.7A (*see wiring diagram*).
The CD120W3 & CD150W3 units are supplied configured for 208v supply.

In order to maintain the **UL listing** of the CDU, type RK5 fuse protection must be installed upstream of this unit, as specified on sht.3 of the CDU wiring diagram (see page 54).

Terminals nos. 1 to 2 and 3 to 4 in the electrical box (supplied linked) can, if required, be connected to a remote 'Control Switch' and building 'EPO/Fire shut down system'. Breaking either of these circuits will shut the unit down in an emergency (*refer to wiring diagram*).

INSTALLATION (continued)

A room temperature & RH sensor is provided with every CDU. As standard this is fitted on the cabinet front door behind a ventilation grille. If required the sensor can be mounted remotely with the appropriate cable kit, to be installed on a wall adjacent to the IT enclosures at a height of approx 1.8M (71").

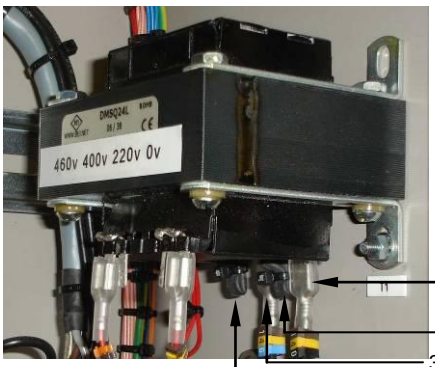


Fig. 2 – Control Transformer tappings

4.3 Hydraulic

The Primary chilled water hoses can be routed either through the floor void to enter the cabinet from below along with the process hoses, or from above via the two cut outs in the rear of the cabinet roof panel. Ball valves are provided for chilled water isolation along with 1½" flexible hose connections for soldering/brazing to either a 1½" or 42mm copper hard piped installation. The copper pipe should be suitably supported at installation as close to the stainless braided flexible hose as possible – do not clip to the cabinet frame.
All primary circuit pipework, hoses and valves should be insulated against condensation.

When the optional internal manifolds are fitted, the secondary circuit hoses should be routed out through the bottom of the cabinet and through the floor void to each RDHx. Quick release self sealing couplings are provided on the manifolds for hose connection (see Fig. 3). Crush and kink resistant ¾" bore PVC hose should be used with a minimum working pressure of 10Bar (145PSI) to connect the CDU cabinet to each RDHx.

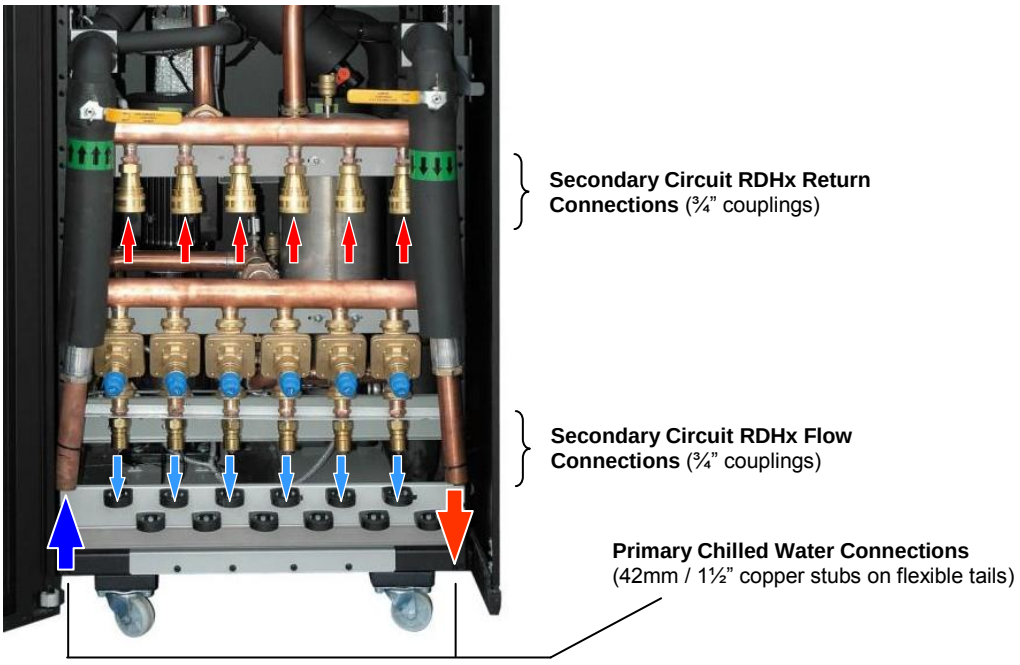


Fig. 3 - Hose Connections (shown with optional internal manifold)

INSTALLATION (continued)

4.4 Heat Transfer Fluids

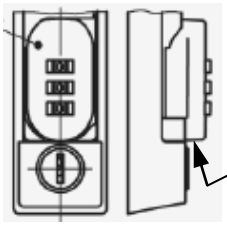
The CDU cabinet is designed for use with a primary circuit supply of plain water or up to 30% glycol/water from by a site chilled water ring main or a dedicated chiller - a 30% glycol concentration will give protection to approx -14°C (7°F).
The secondary circuit should be filled with particulate free deionized water treated with suitable corrosion inhibitors and preservatives.
For ease of installation and commissioning, premixed treated water designed specifically for the requirements of closed secondary cooling circuits can be offered as an optional kit. Failure to use proper water treatment may result in decreased system performance and reliability due to corrosion, scaling, fouling and microbiological growth.

4.5 Flushing

Where an under floor manifold is installed, provision should be made for flushing connections.

4.6 Door Lock Details

The swing handle locks fitted to both front and rear doors have combination lock as standard, which can be set as below:



To set a new code

1) Make sure the thumb wheels are in the original factory set position '000'.

2) Using a sharp pointed object, push the tip into the small round hole located at the bottom of the lock.

3) Turn the 3 wheels to your new required combination and release tip.

To reset again, turn combination to your new code then follow steps 2-3.

NOTE: Always keep a record of your new code – once lost there is no override facility! The master key provided will always override the combination lock, but will not reset the combination.

COMMISSIONING

Section 5

5.1 Pre-Commissioning Checks

- Check that all items within the unit are secure and undamaged. Pay particular attention to the pipework.
- Inspect all wiring and check that all terminations are tight, especially any ground (earth) connections.
- Ensure that the power supply is correctly connected – see wiring diagram/data plate for rating.
- Check the required number of RDHx has been correctly piped up via quick release couplings to the supply and return manifolds (if fitted) in the cabinet and all hose connections are tight. Where the optional manifold is installed, fully open the automatic flow balancing valves on the supply manifold (blue handles) for each RDHx connected.
- Check that the primary chilled supply is connected and hose connections are tight.
- Check that drain point on the drip tray sump is capped and all drain valves are closed (see Fig. 9 on page 40).
- Check that fuse rating of the power supply is in accordance with the recommendations on the wiring diagram and motor overload devices are set as per the wiring diagram.
- Ensure that cooling water supply does not exceed 10Bar (145PSI) pressure.
- Ensure the bleed screws on the four automatic air vents are loose but have not been removed (see Front View image on page 7 for identification).
- Remove pump transit bracket *(this is optional and can be left in position if preferred)*.

5.2 Chilled water

Crack open the inlet and return ball valves fitted at the back of the CDU cabinet (see Fig. 4) to allow the primary circuit within the cabinet to gently fill from the chilled water supply. The trapped air in this circuit may be expelled using the manual air bleed valve situated on top of the pipe at the primary entry into the plate heat exchanger. Once the circuit is filled, the ball valves may be opened fully. Check for leaks.

Fig. 4 - Primary Connections

5.3 Controller Setup

NOTE: This operation and the following (5.4) will already have been carried out at during the factory test and will only need to be repeated after a software upgrade.

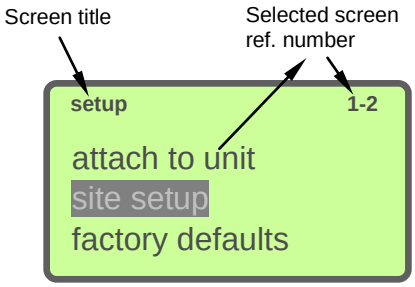
The power supply may now be switched on using the disconnect (isolator) on the control panel.
Refer to **Section 6.1** for a description the screen display and general controller information. Before actually starting the unit, it will be necessary to setup the controller for the number of RDHx's attached. This will then automatically select various software parameters to suit the installation.
To adjust the rack number:

Press keys ◁ & ▷ together for 1 to 2 seconds to enter the next screen from the welcome screen.
Scroll to 'Logon' and press OK. Enter the 'Service' access code (5699) using △ ▽ ▷ keys and press OK.
Scroll up to 'Setup' and press OK to display the screen below.

COMMISSIONING (continued)

Select 'site setup' and press OK. Use keys △ ▽ to set the number of RDHx attached to the unit, then press OK.

Likewise, set the units to SI or imperial* as required & press OK, followed by the Daylight Saving hours, Date Format and Date & Time followed by OK on each occasion. Press the ESC key to return to welcome screen.



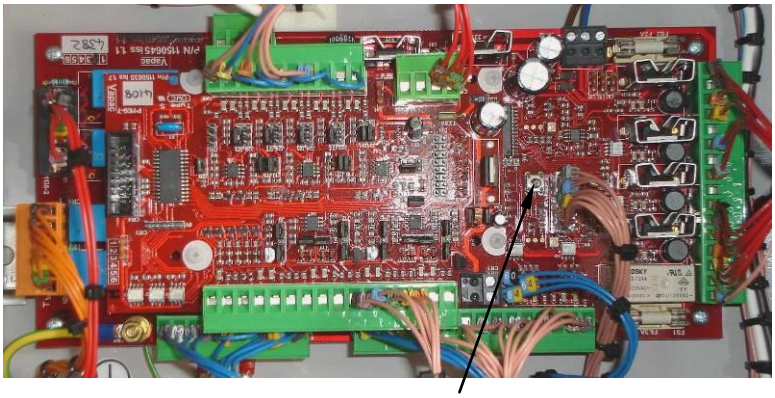
** Note: If 'units' are changed during CDU operation, any parameters that have been previously adjusted will revert to default values.*

5.4 Attaching to Mother Board (already carried out during factory test)

If, on power up, the display screen shows 'Setup' it means that the display communications with the controller needs to be re-established. This will need to be done while the system is live. Switch off the disconnect (isolator), open up the control panel and switch the disconnect (isolator) back on at the base unit. Press OK, the display screen will show `attach to unit'. Press OK, the display screen will show 'Waiting for Service' msg.

DANGER: This should only be carried out by a qualified electrician.

Next press the controller reset button found adjacent to connector CR4 on the controller mother board.



Reset button beside connector CR4

When the reset button is pressed, the screen will go direct to 'Site Setup' where the number of RDHx's operating units and the time & date can be set as described in **Section 5.3.** The screen will then return to the normal welcome screen.

5.5 Display Contrast

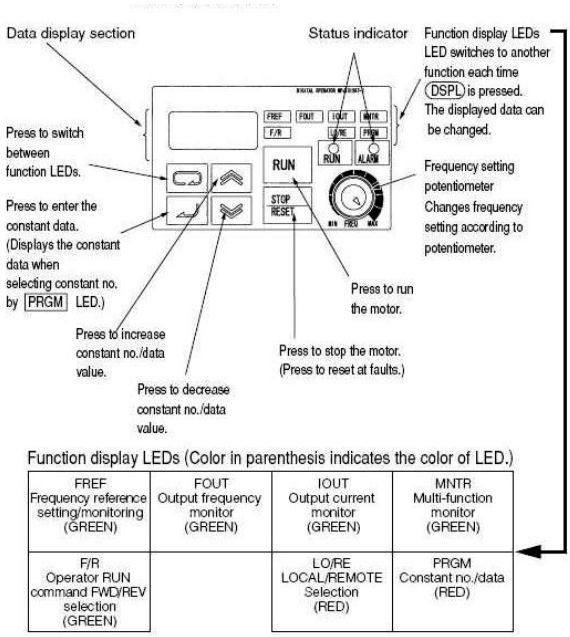
If the display is faint or the text background too dark, the display contrast should be adjusted. Switch off the disconnect (isolator), open up the control panel and switch the disconnect (isolator) back on at the base unit.

DANGER: This should only be carried out by a qualified electrician.

Adjust the pot on the display PCB shown in the picture, until display becomes clear.

COMMISSIONING (continued)

5.6 Inverter Setup



The inverter drive has a separate display and keypad as detailed on the left. The display is set as standard to show the frequency output to the pump motors, but repeated pressing of the key with the circular arrow, will also show also the frequency reference value and current drawn by the pump.

There are 79 adjustable parameters within the inverter that have been factory preset to the values shown in the table below (for full information on each parameter, refer to the inverter drive guide). Parameter n01, when set to 0, locks parameters n02 to n79 (set n01 to 1 for adjustment) – parameters can only be changed when in the PRGM mode and the inverter is not operational. The Run, Stop/Reset keys and the frequency setting potentiometer are for manual operation only and have been disabled in the setup.

If the inverter goes to a fault condition the red alarm LED will blink on and off and an alarm code will show in the inverter display window (refer to inverter guide for full details).

Parameter n78 will display a fault code if the inverter goes into a fault condition. This information will be required by the CDU manufacturer for fault diagnosis.

Parameter	Setting
n01	0
n02	1
n03	2
n04	0
n05	1
n06	1
n07	0
n08	0
n09	60.0
n10	400/208
n11	50.0
n12	1.5
n13	24/12
n14	1.5
n15	24/12
n16	10.0
n17	10.0
n18	10.0
n19	10.0
n20	0

Parameter	Setting
n21	6.0
n22	0.0
n23	0.0
n24	0.0
n25	0.0
n26	0.0
n27	0.0
n28	0.0
n29	6.0
n30	100
n31	0
n32	6.3*/10.8
n33	0
n34	8
n35	0
n36	2
n37	5
n38	3
n39	6
n40	13

Parameter	Setting
n41	100
n42	0
n43	0.10
n44	0
n45	1.00
n46	3
n47	2
n48	0
n49	0.0
n50	0.0
n51	0.0
n52	50
n53	0.5
n54	0.0
n55	0
n56	170
n57	160
n58	0.0
n59	0
n60	160

Parameter	Setting
n61	0.1
n62	0
n63	1.0
n64	3.2
n65	33
n66	0.0
n67	2.0
n68	0
n69	0
n70	0
n71	2
n72	0
n73	10
n74	0
n75	0
n76	RDY
n77	0
n78	---
n79	020

Note: Alternative settings for CDU121 & 151 (*208-230v operation*) are shown in Blue.
* This setting (6.3A) is for 380-415 volts, for 460-480 volts change to 5.7A (*refer to wiring diagram*).

COMMISSIONING (continued)

5.7 System Filling

Refer to **Section 3.4** for system fluid capacities

Operation – for secondary circuit filling

- It will not be possible to start the unit with the 'Unit Start/Stop' pushbutton until the system has been manually filled with deionized water (i.e. system start is inhibited by reservoir low level and low pressure interlocks).
- Position container of pre-treated deionized water in front of the cabinet.
- Remove the filling wand from its storage location on the right hand side of the cabinet and connect to the fill hose (white quick release coupling), then insert to the bottom of the water container (see Fig. 5) and press the 'Fill Pump Enable' pushbutton.
- The fill pumps will then start pumping the contents of the container into the system at the rate of approx. 2l/m (0.5USgpm). The pumps may be noisy to start with as they self prime. See page 21 for how to monitor system pressure during filling process.
- Stop the pumps by pressing the 'Fill Pump Enable' pushbutton again before the level drops below the wand intake, to avoid air being drawn into the system.
- If more than one container of treated deionized water is required (see capacities in **Section 3.4**), repeat the procedure above until the fill pumps automatically stop. Pumps will stop when inlet pressure 'PS1' reaches 0.5Bar (8PSI). Leave the filling wand in the container - more water will be required during the initial stages of operation as air is expelled from the system and the main pump inlet pressure (PS1) drops.
- Check for leaks.
- Once the unit is commissioned – the filling wand may be disconnected at the white quick release coupling and the fill hose then connected to the blue flexible make-up container. Excess treated water may be used to fill this make-up container - approx. capacity 2L (0.53USgalls), which will allow the unit to self-fill while unattended in the event of minor water loss or when any remaining trapped air is purged out of the system. The container should be regularly inspected during service visits and refilled if required, however any fill pump activity after commissioning is logged as a Check Water Make-up Level warning, as a reminder for investigation.
- Before connecting the blue flexible make-up container, the air in the container hose should be removed. Fill the container with water, screw on the fill cap and then squeeze the bag while depressing the valve on the end of the quick release coupling (see Fig. 6) until air is expelled and hose is full of water.

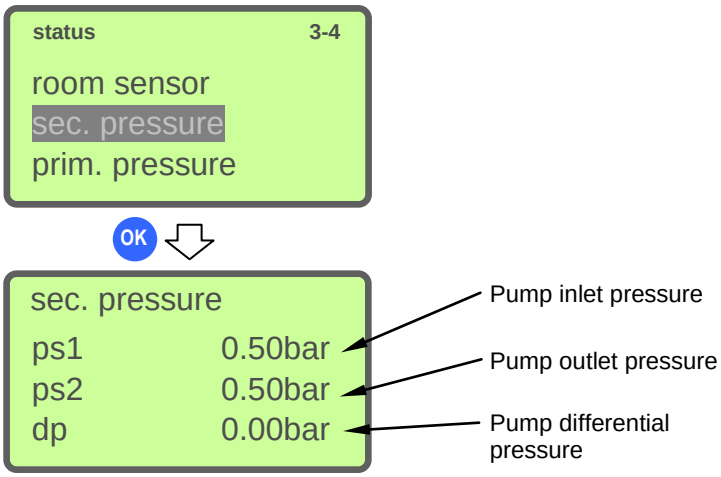
Fig. 5 - Filling wand

Fig. 6 - Make-up container

NOTE: If there is already pressure in system and air is introduced into the fill pump suction line, then the fill pumps may not be able to purge this air through the system and may cease to pump. To rectify, switch unit off and relieve secondary circuit pressure at drain valves(s), then refill system again as above.
Alternatively, leave the unit running while opening a drain valve to relieve pressure, until fill pumps start to pump.

COMMISSIONING (continued)

The 'Status' & 'Sec. pressure' screens can be used to monitor the secondary circuit pressure during the system filling process.
See **Section 6.1** for further information on how to access.



5.8 General - Manual Control & Overrides

In Manual Control mode *(accessible when logged on at 'Service' level),* some automatic control functions can be manually set without affecting the operation of the rest of the unit. This can be done within the Manual Control screen (screen ref. 4-4), where the following can be set: Speed for Pump 1 or 2 (inverter operation), On/Off of Pump 1 or 2 (DOL operation), position of Valve 1 or 2 as a percentage open, On/Off of fill pumps, On/Off of Warning and Alarm extended events (to check the operation of externally connected alarm circuits).
In addition, the Override mode *(only accessible when logged on at Engineer level)*, allows the operator to put the unit into 'dumb' mode where all outputs need to be manually set. This can be done within the Override screen (screen ref. 4-3), where the following can be set: Digital outputs, Speed for Pump 1 or 2, position of Valve 1 or 2. **Note:** Once the unit is set to a Manual Override state, the unit will shutdown if previously running in automatic mode.

5.9 Manual Control

After the initial fill process, it is preferable to run the unit in 'Manual Control' with a reduced pump speed to gently circulate the water - enabling any trapped air to vent out through the auto air vents.

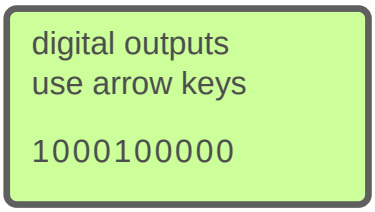
To set the unit for manual operation:

Start the unit, then go to the 'Logon' screen and enter the 'Service' access code as described in **Section 5.3**, scroll down to the 'Service' menu title (screen ref. 4) and press OK. Scroll to the 'Manual Control' menu title (screen ref. 4-4) and press OK. Select 'Secondary Pumps' (screen ref. 4-4-1) and then 'P1 Inverter' (screen ref 4-4-1-1) and press OK. Use the △ or ▽ keys to set the speed to 30% & press OK to accept. (Note: If no keys are pressed within a 15 minute time span, the controller will revert to automatic mode).
While the main pump is running, the fill pumps may switch on again as air is purged from the system.

5.10 Overrides

The unit can also be run in full Override mode *(engineer access required)*, scroll to 'Overrides' screen (screen ref. 4-3) & press OK. Select 'Auto/Man mode' and use the △ or ▽ keys to change display from 'Automatic' to 'Manual', press OK.
Next select the 'Digital outputs' menu title (screen ref. 4-3-2) to display the following screen:

COMMISSIONING (continued)



0 = digital output OFF
1 = digital output ON
(e.g. display above shows Pump P1 selected with inverter drive enabled)

Reading from left to right the digital outputs are:
- Pump P1 contactor (inverter drive)
- Pump P2 contactor (inverter drive)
- Pump P1 contactor (DOL)
- Pump P2 contactor (DOL)
- Inverter drive enable signal
- Inverter drive fault reset
- Level 1 fault alarm
- Level 2 fault alarm
- Fill pump P3
- (not used)

Using the arrow keys, set 'Pump 1 contactor (inverter drive)' and 'Inverter drive enable signal' to 'ON'. Press OK to accept, then ESC to return to previous screen and scroll to 'AO1 – Inverter' (screen ref. 4-3-3). The pump speed can be set here as a percentage – a 30% speed is recommended for an initial setting. When the OK key is pressed, Pump 1 will ramp up to the set speed.

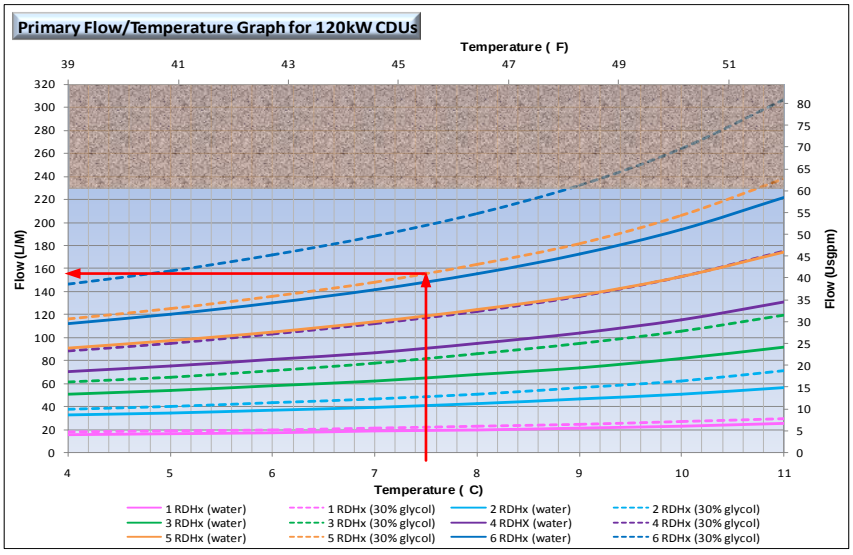
5.11 Pump Rotation

Once the unit is running, the direction of pump rotation should be checked, the pump should rotate in an anti-clockwise direction when viewed from above. This can be determined by watching the motor fan slowing down when the unit is switched OFF. If the direction is clockwise then invert 2 – phases on the electrical supply connection.
Pump rotation should be checked in all four pump operating modes, i.e. Pump 1 + inverter, Pump 2 + inverter, Pump 1 DOL & Pump 2 DOL.

DANGER: This should only be carried out by a qualified electrician

5.12 Primary Flow Setup

For best performance the primary water flow rate should be set to an optimum flow. For this purpose, the number of RDHx's connected needs to be considered along with the temperature of the incoming water and level of added glycol. If the water flow is below the necessary requirement, there will be insufficient cooling and the room temperature will start to rise. If there is too much flow, then the temperature control could become unstable.
Refer to the graph in **Section 3.7** for information on the required flow rate based on incoming water temperature, the percentage of added glycol and the number of RDHx's attached to the CDU cabinet.



Example: If 5 x RDHx's are connected to the CDU cabinet and the temperature of the incoming primary water is 7.5°C (45.5°F) with 30% glycol, then the 'minimum' required flow rate would be 155L/M (41USgpm).

COMMISSIONING (continued)

To adjust the primary flow rate:

Set the controller to 'Manual Control' as described in **Section 5.9** and adjust Valve 1 (screen ref. 4-4-2-1 under 'Heat Exchanger') to 100%, this will force Valve 1 to open fully. Next go back to the 'Status' mode of the controller and scroll to the 'Primary Flow' screen (screen ref. 3-8) to see the actual primary flow rate. Use the primary return ball valve (see Fig. 4) to approximately regulate the flow to the required setting. Then use the primary by-pass valve shown in Fig. 7 to give a finer adjustment of the flow. Set Valve 1 setting back to 0% and set controller mode back to 'Automatic' operation.

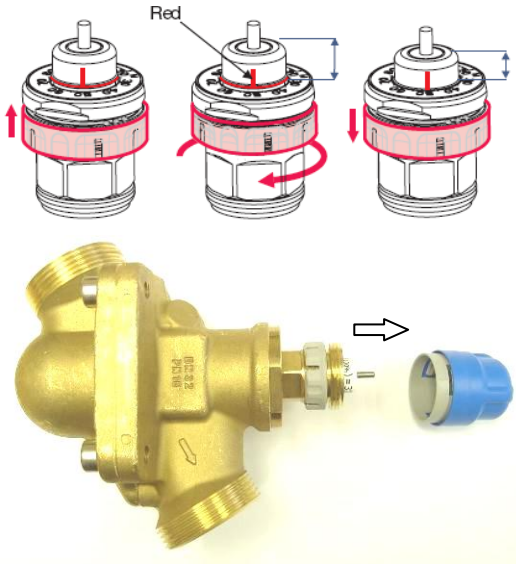
Fig. 7 - Primary By-pass Valve

5.13 Secondary Flow Balancing Valves (optional - as part of internal manifold only)

The secondary supply manifold is fitted with an automatic flow control balancing valve for each circuit. These valves ensure that each circuit always receives the correct flow even if each circuit has a different pressure drop (e.g. due to longer supply/return hose length). The valves are supplied pre-set to 2400L/H (40L/M – 10.6USgpm), but are adjustable from 640L/H to 3200L/H (10.7L/M to 53.3L/M – 2.82USgpm to 14.1USgpm).The valves are set as a percentage of full flow, therefore for adjustment of valves to 2400L/H (10.6USgpm):

$$\textit{Valve setting} = \frac{2400}{3200} \times 100 = \textbf{\textit{75\%}}$$

The valves (see item 26 on page 49) are fitted with a blue plastic cap, which if wound clockwise will close the valve completely. When the cap is fully unwound anti-clockwise until 'loose', the valve will control to its pre-setting and this will be the normal operating position for connected circuits.
To adjust the valve, first remove the blue plastic cap, as shown to the right (**Note**: Only do this when the cap is fully unscrewed and free turning, to avoid damage). Raise the grey plastic ring and turn so that the red mark lines up with the new setting, then release the ring and replace the blue plastic cap (Note when replacing the cap, the arrow markings on the grey section should align with the flats on the threaded section of the brass valve body).



OPERATION

Section 6

6.1 Controller Introduction

The CDU controller has been designed to control the supply of cooling water to up to 6 RDHx's in unattended IT environments. Cooling water is supplied and controlled to a predefined set point at a controlled flow rate.
When power is first applied to the unit using the control panel disconnect (isolator) switch, the main red 'Power On' lamp will illuminate, the inverter drive will energize and the graphic display area of the controller will light up.
The display will show the manufacturer's logo for a few seconds while the controller goes through an initiation cycle. During this time the control valves may cycle open/closed – this is normal.

Graphical Display and Keypad

* Graphical display area

Power On indicator (red)

Warning indicator (flashing amber)

Alarm indicator (flashing red)

ESC button
To return to System (default) Screen in a series of steps back through menu structures

Arrow buttons
For menu navigation and value adiustment

OK button
To enter or accept the displayed value or command & to acknowledge alarms

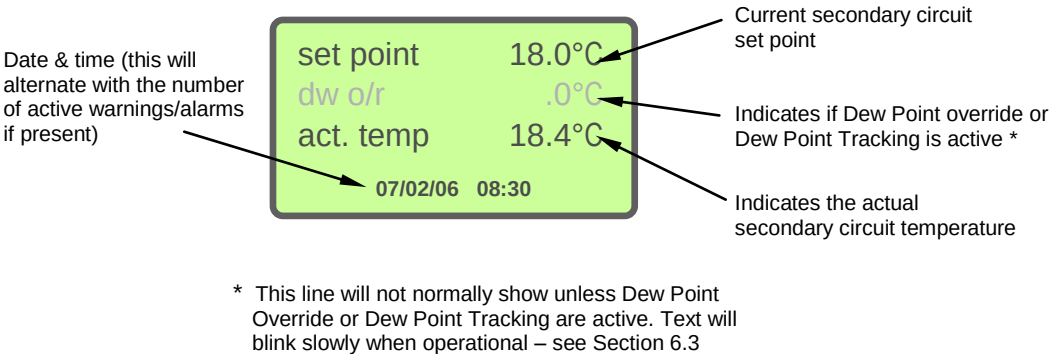
Warning = non-urgent warning alarm (investigate on routine inspection/maintenance)
Alarm = urgent alarm (requiring immediate attention)

See **Section 8.1** for explanation of events.

* Screen shots throughout this guide are shown in SI units only.

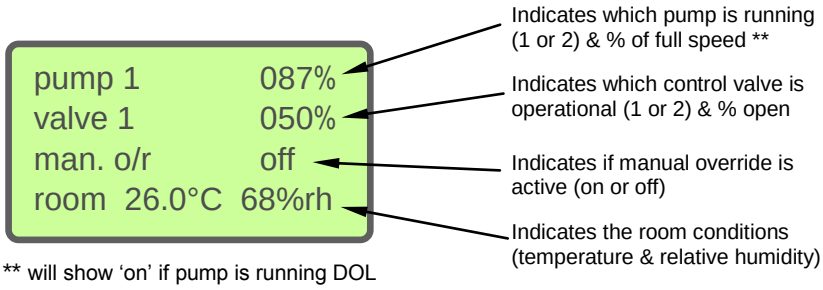
OPERATION (continued)

After initialization, the display panel will default to the welcome screen below:



* This line will not normally show unless Dew Point Override or Dew Point Tracking are active. Text will blink slowly when operational – see Section 6.3

By pressing the display down arrow key ▽, a second information screen can be displayed as below:



** will show 'on' if pump is running DOL

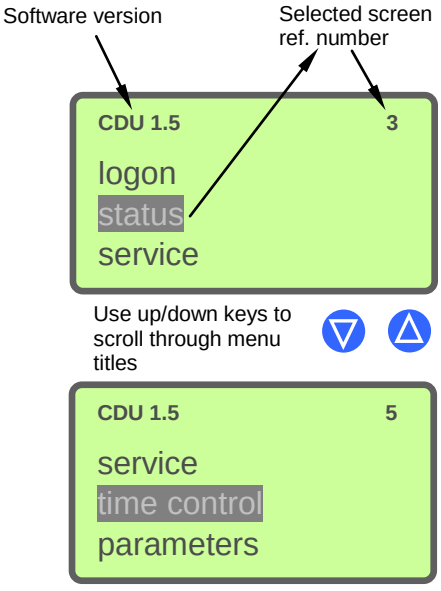
Note: Pressing either the ◁ or ▷ button for 1 to 2 seconds will toggle the display to read imperial units *(when default is SI)*, or SI units *(when default is imperial)*. Display will return to default units when escaped.

To monitor other 'status' functions of the unit:

Press both ◁ & ▷ keys together for 1 to 2 seconds to access the next screen showing a list of menu titles. Scroll to the 'Status' title (screen 3) and press OK to access.

All the information under the 'Status' menu is read only; therefore a logon password is not required for viewing.

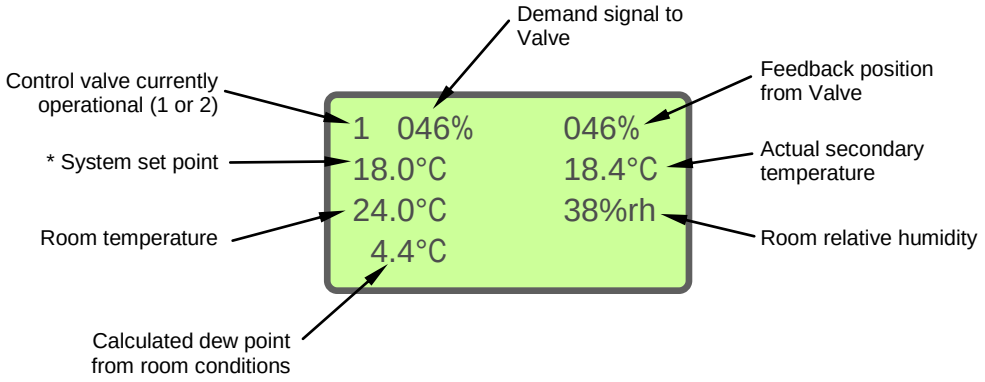
Refer to the table in **Section 6.2** to see which functions can be monitored under the 'Status' screen



OPERATION (continued)

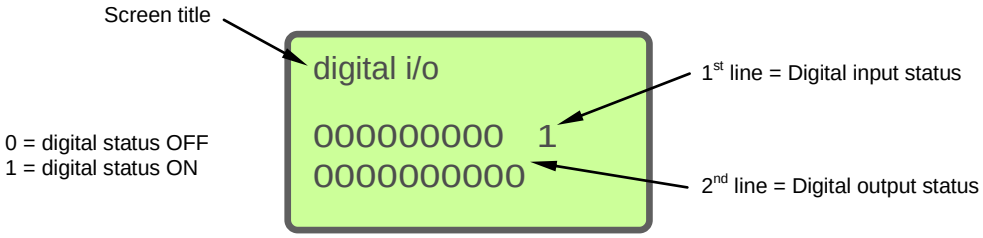
Use the ▽ & △ keys to scroll through the options within the 'Status' screen - refer to the 'Controller Menu Summary' in **Section 6.2** for detail on the viewable information that can be displayed. When a title is highlighted, press the OK key to view the associated information.

Example 1: By selecting the 'Heat Exchanger' title (screen ref. 3-2) and pressing OK, the screen below will be displayed.



* This figure will show the 'Fixed', 'Dew Point Tracking' or 'Ambient Tracking' set points as a steady state display. If Dew Point Override is active, then this figure will alternate between the Fixed Set point and the Override value.

Example 2: By selecting the 'IO Status' title (screen ref. 3-12) and pressing , then selecting 'Digital I/O' + OK, the screen below will be displayed. OK



Reading from left to right the digital I/O are:

Digital Inputs	Digital Outputs
- Reservoir tank level switch	- Pump P1 contactor (inverter drive)
- Inverter fault	- Pump P2 contactor (inverter drive)
- Flood tray float switch	- Pump P1 contactor (DOL)
- Pump 1 DOL overload	- Pump P2 contactor (DOL)
- Pump 2 DOL overload	- Inverter drive enable signal
- Start/Stop push button	- Inverter drive fault reset
- (not used)	- Level 1 fault alarm
- Fill pump push button	- Level 2 fault alarm
- Pulse from primary flow meter	- Fill pump P3
	- (not used)

Note:
The solitary number at the far right of the 1st line (digital inputs), signifies whether 24v supply is present (0 = no 24v) on the controller motherboard. This should be checked if there is ever a complete control failure.

To return to the welcome screen, repeatedly press the ESC key.

OPERATION (continued)

6.2 Controller Menu Summary

All items shown on this background are available to all personnel with no requirement for an access code.

All items shown on this background are only available to service engineers only with the correct access code.

All items shown on this background are only available to factory authorized personnel with the correct 'Engineering' access code.

Controller Menu Structure ***(software version 1.5 shown)***

Screen / Level	Title	Options & *(Info)*
Setup (screen 1)		
1-1	**Attach to unit**	Waiting for service msg. *(press button on mother board to attach)*
1-2	**Site setup**	No. of RDHx 1 to 6 *(set as required)* Units* SI or Imperial Daylight Saving Hours Europe, Manual, No DST or N. America Date Format dd/mm/yy or mm/dd/yy Date & time dd/mm/yy hh:mm:ss *(24 hour clock)*
1-3	**Factory defaults**	Reset parameters to defaults
1-4	**Reset display**	*(Clear screen buffer)*
Logon (screen 2)		
	service code – '5699'	*engineering code – on request from manufacturer*
Status (screen 3)	*- read only information*	
3-1	**Mode**	Standby / Online / Fault / Shutdown / Manual
3-2	**Heat exchanger** *(see page 27 for explanation)*	Valve no -- O/P --- % Act --- % Secondary SP --.- °C(°F) Act --.- °C(°F) Room sensor Temp --.- °C(°F) RH --.- % DP o/r DP --.- °C(°F)
3-3	**Room sensor**	--.- *(temperature)* and --.- *(relative humidity)*
3-4	**Sec. pressure**	PS1 --.-- Bar (PSI) *(pump suction pressure)* PS2 --.-- Bar (PSI) *(pump discharge pressure)* DP --.-- Bar (PSI) *(pump differential pressure)*
3-5	**Prim. Pressure**	PS3 --.-- Bar (PSI) *(filter inlet pressure)* PS4 --.-- Bar (PSI) *(filter outlet pressure)* DP --.-- Bar (PSI) *(filter differential pressure)*
3-6	**Sec. Temp**	T2a --.- °C(°F) *(water supply temperature to RDHx's)* T2b --.- °C(°F) *(water supply temperature to RDHx's)* Ave --.- °C(°F) *(average T2a & T2b)*
3-7	**Prim. Temp**	--.- °C(°F) *(incoming chilled water temperature)*
3-8	**Prim. Flow**	--- L/M (USgpm) *(chilled water flow – not accurate below 20L/M (5USgpm))*
3-9	**Pump Runtimes**	Hours *(total run time in hours of pumps 1 & 2)*
3-10	**Valve 1 Runtime**	Hours *(total run time in hours of valve 1 - at 25,50,75 & 100% positions)*
3-11	**Valve 2 Runtime**	Hours *(total run time in hours of valve 2 - at 25,50,75 & 100% positions)*
3-12	**IO status**	3-12-1 Digital Inputs & Outputs *(see page 27 for explanation)* 3-12-2 Analogue Inputs 3-12-3 Resistive Inputs 3-12-4 Universal Inputs 3-12-5 Analogue Outputs *(Raw input data - for factory information only)*
3-13	**Reset info**	*(Raw data for factory information only)*

** Note: If the 'units' are changed during CDU operation, any parameters that have been previously adjusted, will revert to default values in the new chosen 'units'.*

OPERATION (continued)

Screen / Level	Title	Options & *(Info)*
Service (screen 4)		
4-1	**Force pump c/o**	*(change pump from 1 to 2 or 2 back to 1 – OK to initialise)*
4-2	**Force valve c/o**	*(change valve from 1 to 2 or 2 back to 1 – OK to initialise)*
4-3	**Overrides**	*(no automatic function - for full manual control of all functions)*
4-3-1	Auto/man mode	Automatic / Manual *(set unit to manual or automatic operation)*
4-3-2	Digital outputs	0000000000 *(manually set digital output status – see Section 5.8)*
4-3-3	AO1 – inverter	0 to 100 % *(manually set pump speed)*
4-3-4	AO2 – valve 1	0 to 100 % *(manually set valve 1 position)*
4-3-5	AO3 – valve 2	0 to 100 % *(manually set valve 2 position)*
4-4	**Manual Control**	*(for manual control of some functions while still running in automatic mode)*
4-4-1	Secondary pumps	4-4-1-1 P1 inverter *(set pump speed)* 4-4-1-2 P2 inverter *(set pump speed)* 4-4-1-3 P1 DOL *(switch to Manual for ON)* 4-4-1-4 P2 DOL *(switch to Manual for ON)*
4-4-2	Heat exchanger	4-4-2-1 Valve 1 *(set valve position)* 4-4-2-2 Valve 2 *(set valve position)*
4-4-3	Fill pump P3	Automatic/Manual *(switch to Manual for ON)*
4-4-4	Warning fault	Automatic/Manual *(simulate fault on customer warning relay)*
4-4-5	Alarm fault	Automatic/Manual *(simulate fault on customer alarm relay)*
4-5	**Suppress Events**	*(resets alarm delay timer (scr.6-7) to stop nuisance alarms breaking through screens during manual overrides – OK to initialise)*
4-6	**Reset Run Hours**	
4-6-1	Pump P1	*(set pump 1 run hours to zero – OK to initialise)*
4-6-2	Pump P2	*(set pump 2 run hours to zero – OK to initialise)*
4-6-3	Valve V1	*(set valve 1 run hours to zero – OK to initialise)*
4-6-4	Valve V2	*(set valve 2 run hours to zero – OK to initialise)*
4-6-5	All	*(set all pump & valve run hours to zero – OK to initialise)*
4-7	**Defer Active Event(s)**	
4-7-1	Period	Default 24 Hours [adj. 24, 48. 72 hrs] *(set alarm defer period)*
4-7-2	Initiate	*(OK to initialise)*

Time control (screen 5)		
5-1	**Date & time**	dd/mm/yy hh:mm:ss *(set date & time - 24 hour clock)*
5-2	**Date format**	dd/mm/yy or mm/dd/yy
5-3	**Daylight saving**	
5-3-1	Adjustment	Europe, Manual, No DST or N. America
5-3-2	Manual dates	--/-- --/--

Parameters (screen 6)		**SI UNITS**
6-1	**Reservoir**	
6-1-1	Fill pressure	Default 0.5 Bar [adj. 0.5 to 1 bar] *(shut off threshold for fill pump)*
6-1-2	Fill pump run	Default 3 mins [adj. 1 to 15 mins] *(run time for float switch to make or fill pressure to be achieved, prior to alarm)*
6-1-3	Float switch delay	Default 4 secs [adj. 1 to 30 secs] *(reservoir float switch de-bounce time)*
6-2	**Secondary pumps**	
6-2-1	No of RDHx	Default 1 [adj. 1 to 6]
6-2-2	DP setpoints *(pump differential pressure set points for pump speed control loop)*	6-2-2-1 Sys diff 1 RDHx – Default 2.1 Bar [adj. 0.5 to 4 bar] 6-2-2-2 Sys diff 2 RDHx – Default 2.3 Bar [adj. 0.5 to 4 bar] 6-2-2-3 Sys diff 3 RDHx – Default 2.5 Bar [adj. 0.5 to 4 bar] 6-2-2-4 Sys diff 4 RDHx – Default 2.7 Bar [adj. 0.5 to 4 bar] 6-2-2-5 Sys diff 5 RDHx – Default 2.9 Bar [adj. 0.5 to 4 bar] 6-2-2-6 Sys diff 6 RDHx – Default 3.1 Bar [adj. 0.5 to 4 bar]
6-2-3	DP loop refresh	Default 10 [adj. 5 to 120 secs] *(scan period for pump speed control loop)*
6-2-4	Pump DP hys	Default 0.5 Bar [adj. 0.1 to 3 bar] *(threshold for pump low flow alarm)*

*** SI UNITS ***

OPERATION (continued)

Screen / Level	Title	Options & *(Info)*
6-2-5	Pump DP delay	Default 80 secs [adj. 1 to 300 secs] *(time delay prior to pump low flow alarm)*
6-2-6	DOL DP set point	Default 2 Bar [adj. 1 to 5 bar] *(pump differential pressure set point when DOL)*
6-2-7	PV c/o interval	Default 7 days [adj. 1 to 30 days] *(pump/valve duty sharing period)*
6-2-8	PV c/o time	Default 03:00 hrs [adj. 00:00 to 23:59 hrs] *(time of day for pump/valve duty sharing change over)*
6-2-9	Pump c/o delay	Default 5 secs [adj. 1 to 10 secs] *(dead time between pump change over)*
6-2-10	Max ctrl.press	Default 4 Bar [adj. 1 to 8 bar] *(max pump speed control loop pressure)*
6-2-11	Min pump speed	Default 10 % [adj. 0 to 50 %] *(set minimum pump speed)*
6-2-12	Over pressure	6-2-12-1 Set point – Default 7.5 Bar [adj. 2 to 7.5 Bar] 6-2-12-2 Action – Default Alarm [adj. alarm only / shutdown]
6-2-13	Inverter startup	6-2-13-1 Speed – Default 0 % [adj. 0 to 100 %] *(initial start speed)* 6-2-13-2 Period – Default 0 secs [adj. 0 to 30 secs] *(delay prior to pump speed DP loop becoming operational)*
6-2-14	Fault attempts	Default 1 [adj. 0 to 5] *(no. of inverter restarts before fault recognition)*
6-3	**Heat exchanger**	
6-3-1	Set point	Default 18.0 °C [adj. 10 to 25 °C] *(water supply temperature to racks)*
6-3-2	Valve runtime	Default 40 secs [adj. 10 to 180 secs] *(valve motor run time for control loop)*
6-3-3	Control mode	Default Fixed SP + Dew Point override [adj. Fixed SP, Fixed SP + DW O/R, DW tracking]
6-3-4	Dew point offset	Default 2 °C [adj. 1 to 3 °C] *(maintains set point threshold above dew point)*
6-3-5	CV loop refresh	Default 5 secs [adj. 1 to 30 secs] *(scan period for valve position control)*
6-3-6	Demand/act error	Default 10 % [adj. 0 to 50 %] *(difference between demand & actual valve position prior to alarm / change over)*
6-3-7	Valve check int	Default 15 min [adj. 1 to 120 mins] *(scan period for valve position monitoring)*
6-3-8	Loop settings	6-3-8-1 Prop band – Default 17.0°C [adj. 1.0 to 25 °C] 6-3-8-2 Integral reset – Default 400 secs [adj. 0 to 999 secs]
6-3-9	Sec low temp	Default 2.0 °C [adj. 1 to 10 °C] *(temp. alarm threshold below set point)*
6-3-10	Sec high temp	Default 2.0 °C [adj. 1 to 10 °C] *(temp. alarm threshold above set point)*
6-3-11	Sec temp hys	Default 1.0 °C [adj. 0.5 to 5 °C] *(low/high alarm reset threshold)*
6-3-12	Sec high temp DW	Default 20 °C [adj. 15 to 25 °C] *(high alarm threshold when dew point tracking)*
6-4	**Primary**	
6-4-1	Prim flow delay	Default 5 mins [adj. 1 to 30 mins] *(time delay prior to alarm)*
6-4-2	Prim low temp	Default 4 °C [adj. 2 to 10 °C] *(low temp. alarm threshold)*
6-4-3	Prim high temp	Default 11 °C [adj. 6 to 25 °C] *(high temp. alarm threshold)*
6-4-4	Prim temp hys	Default 1 °C [adj. 0.5 to 5 °C] *(low/high temp. alarm reset threshold)*
6-4-5	Prim filter dirty	Default 0.6 Bar [adj. 0.2 to 1 Bar] *(diff. pressure alarm threshold)*
6-4-6	Prim filter hys	Default 0.2 Bar [adj. 0.1 to 0.5 Bar] *(alarm reset threshold)*
6-4-7	Prim filter delay	Default 60 secs [adj. 5 to 7200 secs] *(time delay prior to alarm)*
6-5	**Offsets**	
6-5-1	Prim temp T1	Default 0 °C [adj. +/-10 °C] *(sensor calibration)*
6-5-2	Sec. temp T2a	Default 0 °C [adj. +/-10 °C] *(sensor calibration)*
6-5-3	Sec. temp T2b	Default 0 °C [adj. +/-10 °C] *(sensor calibration)*
6-5-4	Room. temp T3	Default 0 °C [adj. +/-10 °C] *(sensor calibration)*
6-5-5	Room RH	Default 0 % [adj. +/-10 %] *(sensor calibration)*
6-5-6	Pump PS1	Default 0 Bar [adj. +/-1 Bar] *(sensor calibration)*
6-5-7	Pump PS2	Default 0 Bar [adj. +/-1 Bar] *(sensor calibration)*
6-5-8	Prim filter PS3	Default 0 Bar [adj. +/-1 Bar] *(sensor calibration)*
6-5-9	Prim filter PS4	Default 0 Bar [adj. +/-1 Bar] *(sensor calibration)*
6-6	**Manual period**	Default 15 min [adj. 1 to 120 mins] *(time delay before system reverts to auto)*
6-7	**Event delay**	Default 20 min [adj. 1 to 120 mins] *(alarm suppression on start up)*
6-8	**Flood operation**	
6-8-1	Flood op. switch	Default Alarm [adj. alarm only / shutdown] *(unit flood tray sensor operation)*

*** SI UNITS ***

OPERATION (continued)

Screen / Level	Title	Options & *(Info)*
6-8-2	Flood op. u/f	Default Alarm [adj. alarm only / shutdown] *(under floor sensor tape operation)*
6-8-3	Threshold u/f	Default 143 [adj. 75 to 250] *(u/f sensor sensitivity)*
6-8-4	Flood delay u/f	Default 10 secs [adj. 5 to 60 secs] *(u/f sensor alarm/shutdown delay)*
6-9	**Event relays**	Default N/O [adj. normally closed, normally open] *(relay operation mode)*
Parameters (screen 6)		**IMPERIAL UNITS**
6-1	**Reservoir**	
6-1-1	Fill pressure	Default 8 PSI [adj. 8 to 15 psi] *(shut off threshold for fill pump)*
6-1-2	Fill pump run	Default 3 mins [adj. 1 to 15 mins] *(run time for float switch to make or fill pressure to be achieved, prior to alarm)*
6-1-3	Float switch delay	Default 4 secs [adj. 1 to 30 secs] *(reservoir float switch de-bounce time)*
6-2	**Secondary pumps**	
6-2-1	No of RDHx	Default 1 [adj. 1 to 6]
6-2-2	DP setpoints *(pump differential pressure set points for pump speed control loop)*	6-2-2-1 Sys diff 1 RDHx – Default 30 PSI [adj. 8 to 60 psi] 6-2-2-2 Sys diff 2 RDHx – Default 33 PSI [adj. 8 to 60 psi] 6-2-2-3 Sys diff 3 RDHx – Default 36 PSI [adj. 8 to 60 psi] 6-2-2-4 Sys diff 4 RDHx – Default 39 PSI [adj. 8 to 60 psi] 6-2-2-5 Sys diff 5 RDHx – Default 42 PSI [adj. 8 to 60 psi] 6-2-2-6 Sys diff 6 RDHx – Default 45 PSI [adj. 8 to 60 psi]
6-2-3	DP loop refresh	Default 10 [adj. 5 to 120 secs] *(scan period for pump speed control loop)*
6-2-4	Pump DP hys	Default 8 PSI [adj. 2 to 45 psi] *(threshold for pump low flow alarm)*
6-2-5	Pump DP delay	Default 80 secs [adj. 1 to 300 secs] *(time delay prior to pump low flow alarm)*
6-2-6	DOL DP set point	Default 30 PSI [adj. 15 to 70 psi] *(pump diff. press. set point when DOL)*
6-2-7	PV c/o interval	Default 7 days [adj. 1 to 30 days] *(pump/valve duty sharing period)*
6-2-8	PV c/o time	Default 03:00 hrs [adj. 00:00 to 23:59 hrs] *(time of day for pump/valve duty sharing change over)*
6-2-9	Pump c/o delay	Default 5 secs [adj. 1 to 10 secs] *(dead time between pump change over)*
6-2-10	Max ctrl.press	Default 60 PSI [adj. 15 to 115 psi] *(max pump speed control loop pressure)*
6-2-11	Min pump speed	Default 10 % [adj. 0 to 50 %] *(set minimum pump speed)*
6-2-12	Over pressure	6-2-12-1 Set point – Default 105 PSI [adj. 30 to 105 psi] 6-2-12-2 Action – Default Alarm [adj. alarm only / shutdown]
6-2-13	Inverter startup	6-2-13-1 Speed – Default 0 % [adj. 0 to 100 %] 6-2-13-2 Period – Default 0 secs [adj. 0 to 30 secs]
6-2-14	Fault attempts	Default 1 [adj. 0 to 5] *(no. of inverter restarts before fault recognition)*
6-3	**Heat exchanger**	
6-3-1	Set point	Default 65 °F [adj. 50 to 75 °F] *(water supply temperature to racks)*
6-3-2	Valve runtime	Default 40 secs [adj. 10 to 180 secs] *(valve motor run time for control loop)*
6-3-3	Control mode	Default Fixed SP + Dew Point override [adj. Fixed SP, Fixed SP + DW O/R, DW tracking]
6-3-4	Dew point offset	Default 4 °F [adj. 2 to 6 °F] *(maintains set point threshold above dew point)*
6-3-5	CV loop refresh	Default 5 secs [adj. 1 to 30 secs] *(scan period for valve position control)*
6-3-6	Demand/act error	Default 10 % [adj. 0 to 50 %] *(difference between demand & actual valve position prior to alarm / change over)*
6-3-7	Valve check int	Default 15 min [adj. 1 to 120 mins] *(scan period for valve position monitoring)*
6-3-8	Loop settings	6-3-8-1 Prop band – Default 31°F [adj. 2 to 75 °F] 6-3-8-2 Integral reset – Default 400 secs [adj. 0 to 999 secs]
6-3-9	Sec low temp	Default 4 °F [adj. 2 to 18 °F] *(temp. alarm threshold below set point)*
6-3-10	Sec high temp	Default 4 °F [adj. 2 to 18 °F] *(temp. alarm threshold above set point)*
6-3-11	Sec temp hys	Default 2 °F [adj. 1 to 9 °C] *(low/high alarm reset threshold)*
6-3-12	Sec high temp DW	Default 70 °F [adj. 60 to 75 °F] *(high alarm threshold when dew point tracking)*
6-4	**Primary**	
6-4-1	Prim flow delay	Default 5 mins [adj. 1 to 30 mins] *(time delay prior to alarm)*

*** IMPERIAL UNITS ***

OPERATION (continued)

*** IMPERIAL UNITS ***

Screen / Level	Title	Options & *(Info)*
6-4-2	Prim low temp	Default 40 °F [adj. 35 to 50 °F] *(low temp. alarm threshold)*
6-4-3	Prim high temp	Default 52 °F [adj. 45 to 75 °F] (high temp. alarm threshold)
6-4-4	Prim temp hys	Default 2 °F [adj. 1 to 9 °F] *(low/high temp. alarm reset threshold)*
6-4-5	Prim filter dirty	Default 9 PSI [adj. 3 to 15 psi] *(diff. pressure alarm threshold)*
6-4-6	Prim filter hys	Default 3 PSI [adj. 1 to 8 psi] *(alarm reset threshold)*
6-4-7	Prim filter delay	Default 60 secs [adj. 5 to 7200 secs] *(time delay prior to alarm)*
6-5	**Offsets**	
6-5-1	Prim temp T1	Default 0 °F [adj. +/-15 °F] (sensor calibration)
6-5-2	Sec. temp T2a	Default 0 °F [adj. +/-15 °F] *(sensor calibration)*
6-5-3	Sec. temp T2b	Default 0 °F [adj. +/-15 °F] *(sensor calibration)*
6-5-4	Room. temp T3	Default 0 °F [adj. +/-15 °F] *(sensor calibration)*
6-5-5	Room RH	Default 0 % [adj. +/-10 %] *(sensor calibration)*
6-5-6	Pump PS1	Default 0 PSI [adj. +/-15 psi] *(sensor calibration)*
6-5-7	Pump PS2	Default 0 PSI [adj. +/-15 psi] *(sensor calibration)*
6-5-8	Prim filter PS3	Default 0 PSI [adj. +/-15 psi] *(sensor calibration)*
6-5-9	Prim filter PS4	Default 0 PSI [adj. +/-15 psi] *(sensor calibration)*
6-6	**Manual period**	Default 15 min [adj. 1 to 120 mins] *(time delay before system reverts to auto)*
6-7	**Event delay**	Default 20 min [adj. 1 to 120 mins] *(event suppression on start up)*
6-8	**Flood operation**	
6-8-1	Flood op. switch	Default Alarm [adj. alarm only / shutdown] *(unit flood tray sensor operation)*
6-8-2	Flood op. u/f	Default Alarm [adj. alarm only / shutdown] *(under floor sensor tape operation)*
6-8-3	Threshold u/f	Default 143 [adj. 75 to 250] *(u/f sensor sensitivity)*
6-8-4	Flood delay u/f	Default 10 secs [adj. 5 to 60 secs] *(u/f sensor alarm/shutdown delay)*
6-9	**Event relays**	Default N/O [adj. normally closed, normally open] *(relay operation mode)*

Event Log (screen 7)		
7-1	**View active**	*(view all currently active warnings & alarms)*
7-2	**Clear active**	*(clear all active warnings & alarms)*
7-3	**View log**	*(view last 30 logged warnings/alarms with generated date/ time)*
7-4	**Clear log**	*(clear all logged warnings/alarms)*
7-5	**Diagnostics**	*(Raw data - for factory information only)*

Connectivity (screen 8)		
8-1	**N/W address**	*(network address)*
8-2	**CDUA-133**	*(new style Web server with Modbus gateway)*
8-2-1	Attach	*(attach Web server)*
8-2-2	Remove	*(remove Web server)*
8-3	**CDUA-105-X**	*(older style Web server / Modbus gateway **)*
8-3-1	Web server	8-3-1-1 Attach *(attach Web server)*
		8-3-1-2 Remove *(remove Web server)*
8-3-2	Modbus	8-3-2-1 Attach *(attach modbus)*
		8-3-2-2 Remove *(remove modbus)*
		8-3-2-3 Status
		8-3-2-4 Address - Default 1 [adj. 1 to 247] *(modbus address)*
		8-3-2-5 Protocol - Default rtu [adj. rtu or ASCII] *(modbus protocol)*
8-4	**Status**	*(web server / modbus gateway operational diagnostics)*

** CDUA-105-1 Web server only
CDUA-105-2 Modbus gateway only
CDUA-105-3 Web server with Modbus gateway

OPERATION (continued)

6.3 Automatic operation

After commissioning, the unit will be ready to run in automatic mode – press the Start/Stop button on the control panel to start the unit.

Secondary Circuit Operation

- On receiving a start signal, the green Start/Stop push button will illuminate and providing the reservoir level switch is made, Pump 1 will start to increase in speed – the pump speed as a percentage of maximum can be read from the second welcome screen (see **Section 6.1**). The inverter display will also show the actual 'frequency' output to the pump motor.
  - *If the level switch is not made, signifying insufficient water, then neither main pump will be allowed to run.*
  - *In this event, the fill pumps will automatically initialise in an attempt to refill the system and the green 'Fill Pump Enable' lamp will illuminate. If after a period of 3 minutes the level switch has still not made, then the fill pumps will stop and an 'Insufficient Water Level' alarm will be generated. It will not be possible to restart the unit until the alarm has been manually cleared.*
- The system pressure at the pump suction (PS1) is continuously monitored (see controller screen 3-4) to ensure that the system is always pressurized.
  - *A low system pressure of 0.3Bar (5PSI) or less at PS1 will not stop the main pumps from running, but will again initialise the fill pumps (after a 10 second delay) to raise the PS1 pressure to 0.5Bar (8PSI), at which point the fill pumps will stop. At the same time a 'Check Water Make-up Level' warning will be generated. As previously, if the fill pumps run for more than 3 minutes and the PS1 pressure has still not reached 0.5Bar (8PSI), then the fill pumps will stop and a 'Water Make-up Empty' warning will be generated. This is a latched warning and will need to be manually cleared, but will not stop the unit operating.*
- The differential pressure across the operational pump is monitored with sensors PS1 & PS2 (see controller screen 3-4) and on start up, the pump speed is increased in stages via a control loop until the differential pressure matches a predefined setting in the software, based on the number of RDHx's set during the commissioning stage. The pump pressure control loop has a scan default time of 10 seconds to avoid control oscillation.
  - *If Pump 1 fails to reach within 0.5Bar (8PSI) of this differential pressure in a set time period (default 80secs), then it is assumed that there is a pump flow fault – Pump 1 will ramp down to a stop and Pump 2 will be initialised after a 5 second interval. At the same time, a 'Pump 1 Inverter Low Flow' alarm will be generated.*
  - *If Pump 2 also fails to reach the differential pressure within the time limit, then this pump will also ramp down to a stop and Pump 1 will be started direct on line (DOL). At the same time, a 'Pump 2 Inverter Low Flow' alarm will be generated.*
  - *If Pump 1 DOL fails to reach an alternative differential pressure set for DOL operation (default 2Bar (30PSI)), then it too will stop and Pump 2 will be started DOL. At the same time, a 'Pump 1 DOL Low Flow' alarm will be generated.*
  - *In the event that Pump 2 DOL also fails to reach pressure, a 'Pump 2 DOL Low Flow' alarm will be generated. The unit will then continue to operate with Pump 2 DOL until alarms are manually cleared and faults investigated.*
- During normal healthy running, the pumps will operate on a duty sharing cycle, i.e. every 7 days (default) the operational pump will ramp down to a stop and the standby pump will then start after a 5 second delay to continue operating for the next 7 days etc. Changeover default time is set at 03:00 in the morning.
- The secondary water temperature is monitored at the reservoir outlet. Two temperature sensors are positioned here to give component redundancy. The controller will take an average between the two readings as its input value. If the difference between the two sensors exceeds 1.0°C (2°F), then a 'Secondary Temp Diff Error' alarm will be raised (after a 2 minute delay).

OPERATION (continued)

If either sensor goes open circuit, then a 'Sec Temp Out of Range' alarm will be raised and the controller will read the remaining working sensor only.
The secondary temperature should correspond to the desired set point temperature – default fixed set point is 18°C (65°F) as displayed on the welcome screen and is used by the control loop to regulate the primary water control valve position to achieve and maintain the set point. The control valve position can be monitored on the second welcome screen (see **Section 6-1**) or screen 3-2 under the Status title. High and low temperature warnings are set at a default value of 2°C (4°F) either side of set point (floating with set point) when either 'Fixed SP' or 'Fixed SP + Dew Point override' control is selected from screen 6-3-3, with a default hysteresis of 1°C (2°F).

- *If the secondary temperature deviates by more than 2°C (4°F) above set point for 2 minutes or more, a 'Secondary Water Temp High' warning will be generated. This alarm will remain present until the temperature falls below the hysteresis value.*
- *If the secondary temperature deviates by more than 2°C (4°F) below set point for 2 minutes or more, a 'Secondary Water Temp Low' warning will be generated. This alarm will remain present until the temperature rises above the hysteresis value.*
- *The high and low temperature warnings are ignored for a period of 20 minutes (default) on start up to allow the system time to settle without generating nuisance alarms.*

- In 'Fixed Sp + Dew Point override' control mode, the set point can be overridden by a Dew Point condition – i.e. where there is a risk of condensation occurring at the RDHx's.
  - *Dew Point Override (flashing '**dw o/r --.-°C (°F)**' on welcome screen display when activated) – Room temperature and relative humidity are constantly monitored by remote sensor and used by the controller to calculate the anticipated dew point within the room. If there is a risk of condensation within the RDHx's, the controller will override the set point to a default value of 2°C (4°F) above dew point. The Dew Point override will then show the new set point value as a flashing display on the second line of the welcome screen (& also on the Status screen 3-2, which will alternate between fixed set point & override set point).*

- Alternatively, if 'Dew Point Tracking' is the chosen control mode, then the set point will continually re-adjust to maintain the supply temperature at a default of 2°C (4°F) above the current dew point.
  - *Dew Point Tracking (flashing '**dw tracking**' on display) – Room temperature and relative humidity are constantly monitored by remote sensor and used by the controller to calculate the anticipated dew point within the room. The controller will then calculate a set point to maintain the water temperature at a default setting of 2°C (4°F) above this value. The welcome screen will then show the new set point value with 'DW Tracking' as a flashing display on the second line (new set point also visible on the Status screen 3-2).*

***Note:** Although the controller will display the new Dew Point Tracking set point, this may not always be achievable as it will often fall outside the cooling capacity of the unit, i.e. if the dew point was 7°C (44°F), then the controller would re-adjust the set point to 9°C (48°F), however, the plate heat exchanger is sized for a minimum temperature differential between primary water inlet and secondary outlet temperatures of 8°C (14.5°F). Therefore, if the primary water temperature was 10°C (50°F), then a secondary set point of 9°C (48°F) would be unachievable and the 'actual' temperature displayed would be unlikely to fall below 18°C (64.5°F). For this reason it is not possible to operate a Secondary High/Low temperature warning as with the 'Fixed SP' or 'Fixed SP + Dew Point override' control modes that floats with the set point, as the unit could be constantly in warning condition. In this instance, a fixed Secondary Water Temp High warning is set at a default value of 20°C (70°F) and the Secondary Water Temp Low warning is only enabled when the temperature drops to or below the dew point for a period of 3 minutes or more.*

OPERATION (continued)

Primary Circuit Operation

- The primary water temperature is monitored at the inlet to the CDU cabinet. The cooling performance of the CDU cabinet has been calculated on a water temperature between 5 and 10°C (41 and 50°F).
  - *If the primary temperature rises to 11°C (52°F), a 'Primary Water Temp High' warning will be generated. This warning will remain present until the temperature falls below the default 1°C (2°F) hysteresis value.*
  - *If the primary temperature falls to 4°C (40°F), a 'Primary Water Temp Low' warning will be generated. This warning will remain present until the temperature rises above the default 1°C (2°F) hysteresis value.*
  - *The high and low temperature warnings are ignored for a 20 minute period (default) on start up to allow the system time to settle without generating nuisance alarms.*

- The temperature PI control loop will be operational from when the Start/Stop button is pressed and the pump has ramped up to speed. If the secondary circuit temperature starts to rise above the set point, then control Valve 1 will start to open to allow more primary cooling water through the heat exchanger. The control valve will modulate from 0% (closed) to 100% (fully open) - the valve position can be monitored on the second welcome screen or Status screen 3-2. The demand signal to the valve is compared to a position feedback signal every 15 minutes (default) to check the healthy operation of the valve.
  - *If the feedback signal is more than 10% different from the demand signal (allowing for the drive time of the actuator to respond to load changes), then a 'Valve 1 Fault' warning will be generated, Valve 1 will be driven closed and the demand signal transferred to Valve 2.*
  - *Similarly, with Valve 2 if the feedback signal is more than 10% different from the demand signal (allowing for the drive time of the actuator to respond to load changes), then a 'Valve 2 Fault' warning will be generated, Valve 2 will be driven closed and the demand signal transferred to Valve 1.*
  - *If both Valve 1 & Valve 2 are in fault condition, then the warning status of each will be elevated to alarm level (operation will revert back to the default valve and will stay on that valve until fault is rectified).*

- During normal healthy running, the control valves will operate on the same duty sharing cycle as the pumps, i.e. every 7 days (default) the operational valve will ramp down to closed and other valve will then respond to the demand signal to continue operating for the next 7 days etc. Changeover default time is set at 03:00 in the morning.

- Both control valves have a 'spring return' function to ensure the valves close in the event of a power failure.

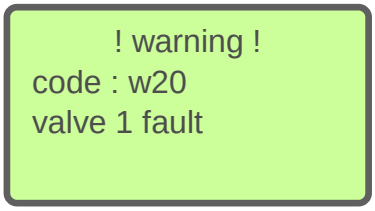
- A 300µ (50mesh) primary water filter is fitted at the chilled water inlet to the plate heat exchanger. The differential pressure is monitored across this filter with sensors PS3 & PS4 (see controller Status screen ref. 3-5) to predict when the filter requires cleaning/flushing.
  - *If the differential pressure exceeds 0.6Bar (9PSI), then a 'Primary Filter Dirty' warning is generated. Filter may be flushed while operational as described in* ***Section 7.5****.*

- A flow meter in the primary water return line monitors flowrate. The flow can be read within the controller Status screen ref. 3-8. **Note:** The flow meter is in series with the flow control valves and will therefore only register a flow when either valve is open or partially open.
  - *A 'Primary Low Flow' warning is generated only if the following conditions are met:- The Secondary High Temperature warning is active, there is no Primary High Temperature warning present and the demand to the operational control valve is at 100%.*
  - *A 'Primary No Flow' alarm can also be generated when the following conditions are met:- The Secondary High Temperature warning is active, there is a Primary High Temperature alarm present and the demand to the operational control valve is at 100%.*
  - *Note: Flows below 20L/M (5USgpm) will not be accurate and may not display at all.*

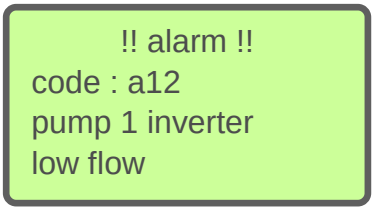
OPERATION (continued)

6.4 Acknowledgement of Event Messages

Event messages will break through onto the welcome screen as and when they occur, as in the example below. Events are categorised into two levels: 'Warnings' and 'Alarms'.
See **Section 8.1** for identification of all event messages.



Typical Warning screen



Typical Alarm screen

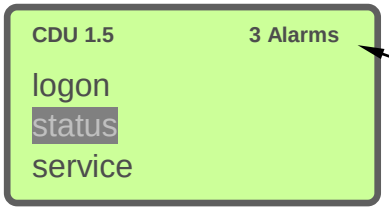
When an event condition occurs, two things will happen:

- The initiated event will break through onto the normal screen, the display will then alternate between the event message and the normal screen. If more than one event is present, the display will alternate between scrolling through the events, then back to the normal screen etc.
- The event is automatically logged in the Event Log with the date & time at which it was generated (see Screen 7-1 to review active events and Screen 7-3 to see the full log history).

The Event Log keeps a rolling record of the last 30 generated events. When the Log reaches the limit of 30, the next event generated will drop the oldest event out of the log etc.

All event messages can be acknowledged by pressing the OK key once for each event as they break through. This will stop the alarm(s) from breaking through the normal screen and deposit them in an 'Active' list.
After acknowledgement and in order to keep the operator informed that event(s) are still active, the time and date on the welcome screen will alternate with the number of active events, broken down into 'Warnings' and 'Alarms' if both are present. Similarly, if the screen is displaying a sub-screen, then the top right hand corner of the display will alternate between the screen identification number and the number of active events.
All active / acknowledged events can be reviewed by going to Screen 7-1.

Some events will 'self clear' if the event is a transient one (e.g. a temperature hits a warning threshold then comes back to a healthy condition) or when the fault has been rectified (e.g. a faulty sensor has been replaced). The self clearing alarms are identified in **Section 8.1**.



Text in top right hand corner of screen will alternate from displaying the Screen identification number, to number of active Events when present (i.e. number of Active Warnings and/or number of Active Alarms).

All events that self clear will continue to remain present the Event Log however, until forced out by the over 30 event rule, or when the Event Log is manually cleared by an engineer after logging on under the 'Engineering' access code.

Events that do not self clear, as identified in **Section 8.1** and require operator intervention for rectification (e.g. to reset a tripped overload) will need to be manually cleared from the 'Active' list by an engineer after logging on under the 'Engineering' access code.

OPERATION (continued)

6.5 Defer Active Event(s)

When a Warning or Alarm event is generated, volt free relay contacts are also activated within the controller to give a remote monitoring/extended event facility.
Where these event outputs are utilised by the customer, they can be deferred by a service engineer (see screen 4-7) for a period of 24, 48 or 72 hours. This means that if an engineer is unable to immediately rectify a warning or alarm condition when called to site (e.g. a spare part is required), he can defer the event for a set period to signal that the problem is being addressed, while allowing time for the spare part to arrive and be installed. Although the extended event will be cancelled, the unit will remain in warning/alarm condition locally, with the relevant Warning or Alarm LEDs flashing on the controller fascia and the generated event in the 'Active' list until the fault has been rectified.

Any events that have been deferred are identified in the Active list by the prefix 'deferred'. If after the set time period the problem has not been rectified, then the extended event will be reinstated. Similarly, if a new event is generated during the deferred period, then the extended event will again be re-activated.

6.6 Connection of Additional RDHx's

If the CDU cabinet has been installed with less than the full capacity of 6 RDHx attached, then additional RDHx's can be connected up while the system is operational without the need to shut down.

Sequence to attach additional racks (with optional internal manifolds installed)

1. Ensure the blue plastic cap of the flow balancing valve for the new circuit is screwed fully clockwise so that the valve is closed.
2. Have enough new deionized water available (pre-treated with inhibitor/biocide) in a container at the front of the unit to fill the new circuit (refer to **Section 3.4** for volume capacity of RDHx and hoses). Place the filling wand into the container of water.
3. Connect the supply hose of the new RDHx to the supply manifold at the back of the CDU cabinet, using the quick release coupling provided.
4. Turn the blue plastic cap of the flow balancing valve anti-clockwise approx 1/2 a turn to crack open the valve and allow water to enter the new circuit.
5. Open air vent points on the RDHx to allow trapped air to escape – check to see if air is escaping, if not open the valve a little more.
6. As the pressure in the secondary circuit drops, the fill pumps will automatically come on to top up the system with new fluid.
7. Once all the air has been vented from the RDHx and the fill pumps have stopped, i.e. pressure at PS1 has been re-established at 0.5Bar (8PSI), then connect the return hose of the RDHx to the return manifold at the back of the CDU cabinet, using the quick release coupling provided.
8. The remaining air in the return hose will now be pushed into the CDU cabinet to be vented via the inbuilt automatic air vent and the fill pumps will start again.
9. Once the fill pumps have stopped, allow system to run for 10 to 15 minutes with this reduced flow in the new circuit, then fully open the flow/balancing valve to allow the valve to control to 40L/M (10.6USgpm).

OPERATION (continued)

6.7 Control Loop Set-up

The PI temperature control loop calculation is:

Output = Proportional component + Integral component

This is commonly referred to as a ‘non-interacting’ or ‘parallel’ algorithm, where:

The Proportional Component = (Actual temp – Setpoint) / Propotional Band x 100%
The Integral Component = Integral component + [(Actual temp – Setpoint) / (Integral Reset)]

The Integral Component is limited to +/-100

The CDU cabinet has pre-set Proportional and Integral control loop settings for the control valve operation that will give good overall control. If it is found that these settings require adjustment (i.e. the control valve is sluggish to respond to load or is over sensitive and oscillates (hunts), then follow the tuning procedure below:

1. Set Integral Reset (IR) to 0.
2. Set Proportional Band (PB) to the minimum value of 1°C (2°F).
3. Increase PB in steps of 1°C until a sustained and stable oscillation is obtained on the output.
4. Set the IR to 999.
5. Decrease IR in steps of 50 until a steady state is observed on the output.

MAINTENANCE

Section 7

PREVENTATIVE MAINTENANCE

7.1 General

The CDU should be cleaned on a regular basis and checked for leaks and malfunctions.

DANGER: Before starting any maintenance work inside the cabinet, ensure that the unit is electrically isolated/disconnected.

7.2 At 3 Months (or less)

- Flush out or replace the strainer element on the cooling water inlet (see **Section 7.5**).
- Check for any abnormal noises from the pump(s)
- Check contents of flexible water make-up container and top up if necessary with deionized water pre-treated with inhibitor/biocide.
- Check for leaks

7.3 At 6 Months (or less)

In addition to the 3 monthly checks:

- Check condition of hoses
- Check all hose connections for tightness.

7.4 At 12 Months (or less)

In addition to the 3 & 6 monthly checks:

- Check all bolts and seals

7.5 Filter Flushing

The primary filter can be flushed while the system is operational - check the valve located on the bottom of the filter bowl is closed (handle at 90° to valve body) then remove the cap on the end of the valve. Screw on the drainage hose *supplied (see Fig. 8), using sealing washer and place free end of hose into a bucket or similar. Open the filter bowl valve to allow the water flowing through the filter to wash over the filter surface & remove debris out through the hose into the bucket. Flushing out no more than 5L (1.3USgall) of fluid should be sufficient for filter screen cleaning. This is fairly straight forward for the primary circuit, as the water lost will be quickly replenished by the chiller make-up system.

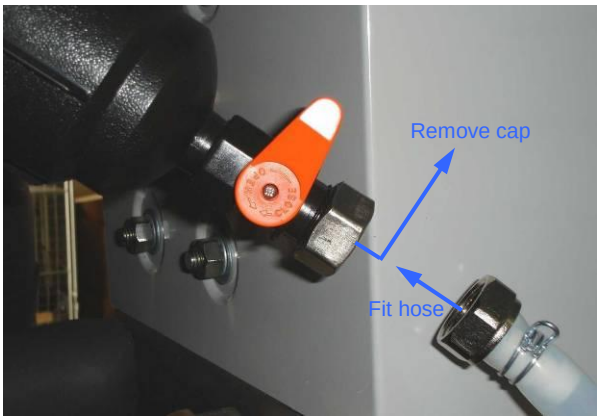


Fig. 8 - Flushing Connection

*Drain hose is supplied coiled and cable tied to the pipework adjacent to the Secondary filter.

MAINTENANCE (continued)

If flushing the filter does not improve conditions, then the filter screen should be replaced.
For the primary circuit, this will mean isolating the cabinet from the chilled water supply by closing the 1½" ball valves at the rear of the cabinet (see **Section 5.2**), then draining the filter with the drain hose as used for the flushing procedure. Once drained the filter bowl may be unscrewed and the filter screen removed & replaced. Re-fit the filter bowl, close the filter drain valve and open the chilled water ball valves again.

7.6 Unit Draining

There are three drain points provided at the front of the unit as shown in Fig. 9.
To drain the primary circuit, first close off both the primary inlet & primary outlet isolation ball valves at the rear of the cabinet (see Fig. 4). Place a suitable collection vessel under the drain pipe and open the drain valve. Note: to assist draining the manual air bleed valve situated on top of the pipe at the primary entry to the plate heat exchanger (see inset photo below). To operate this vent, unscrew the brass cap and depress the visible spindle. The primary filter should also be drained as for filter flushing (see **Section 7.5**).
To drain the secondary circuit, both of the other two drain valves should be used, air will bleed into the system through the automatic air vents. If the unit is to be removed altogether, the RDHx hoses should first be disconnected, then the inlet & return manifolds also drained by manually depressing the self sealing valves within the quick release couplings.
If sufficient drainage is only required for changing a pump, the faulty pump should first be isolated with the red handled valves, then the drain valve opened associated with that pump only. Note: To fully drain the pump prior to removal, also remove the drain plug at the base of the pump (indicated below) – be prepared for a few cupfuls of water to be discharged.

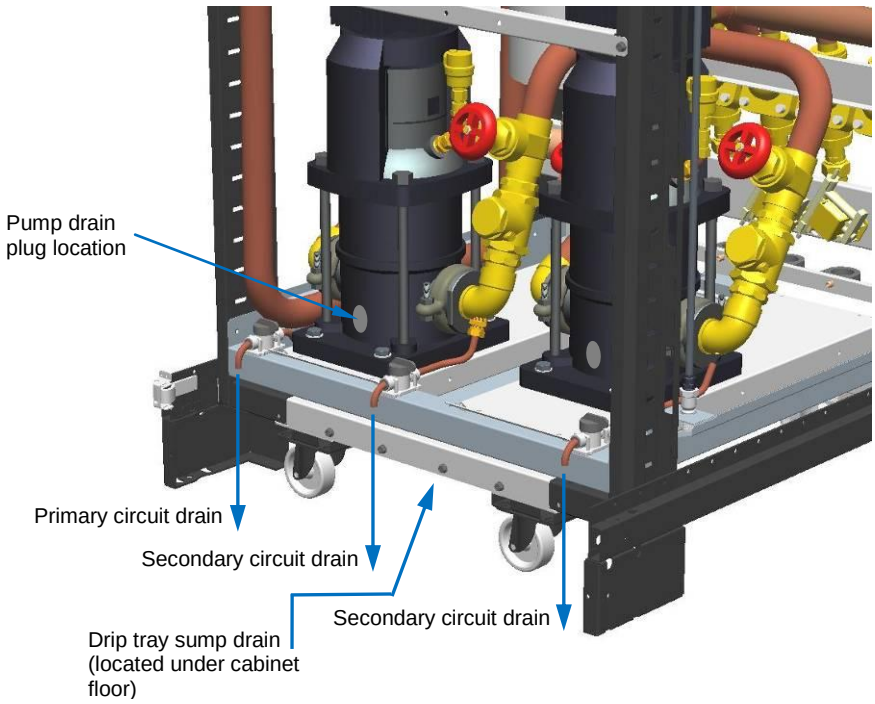
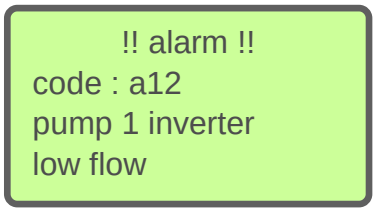


Fig. 9 – Drain Points

TROUBLESHOOTING Section 8

8.1 Summary of Event Messages

See **Section 6.4** for instruction on acknowledging events. Events refer to either Warning or Alarm messages.



Typical Alarm screen

Warnings

Warnings are non-urgent events that are not critical to the operation of the unit, but will require investigation on a routine maintenance visit. The presence of these warnings is identified on the controller fascia by an amber flashing LED.
Note: Warning titles shown in **Green** are delayed on unit start up for a default period of 20 minutes - see 'Event Delay' screen 6-7, to allow the system to settle without nuisance event generation. This delay is also activated when the 'Suppress Events' screen 4-5 is activated.

Code: w09 – 'Water make-up empty' (engineer to clear)
Fill pumps have been running for more than 3 minutes when reservoir level switch is made, but minimum system pressure has not been achieved.
Action: Check the make-up container is full, tubes are free of airlocks, container is properly connected and fill pumps are operational. Check system for leaks.

Code: w20 – 'Valve 1 fault' (engineer to clear)
Feedback signal from valve is more than 10% adrift from demand signal - allowing for positioning time.
Action: Check the wiring connections to the faulty actuator. Try to set the valve actuator manually using the 'Manual Control' function in the controller. Check the voltage out and the voltage return signal of the valve actuator.

Code: w21 – 'Valve 2 fault' (engineer to clear)
Feedback signal from valve is more than 10% adrift from demand signal - allowing for positioning time.
Action: As above

Note: If both valves go to fault condition, then Warning status will be elevated to an Alarm status (codes **a20** & **a21**) and unit will revert to and stay with the default valve, until fault has been cleared.

Code: w22 – 'Primary water low flow' (engineer to clear)
Becomes active under the following conditions:- Valve demand is at 100%, Secondary High Temp alarm is active and Primary water temperature is within limits (default 5 minute delay applies).
Action: Check that the chiller is operational and fault free, clean out the primary filter. Check the load has not exceeded the CDU specification.

Code: w23 – 'Primary filter dirty' (self clear)
Differential pressure across filter is greater than 0.6Bar (9PSI) – cleaning required (default 60 second delay applies).
Action: Flush filter or replace filter screen as described in **Section 7.5**

TROUBLESHOOTING (continued)

Code: w24 – 'Primary water low temp' (self clear)
Primary water temperature has exceeded the 4°C (40°F) threshold (default). Alarm will cancel when temperature rises to 5°C (42°F) or above (default 2 minute delay applies).
Action: Check chilled water supply.

Code: w25 – 'Primary water high temp' (self clear)
Primary water temperature has exceeded the 11°C (52°F) threshold (default). Alarm will cancel when temperature falls to 10°C (50°F) or below (default 2 minute delay applies).
Action: Check chilled water supply.

Code: w26 – 'Secondary water low temp' (self clear)
Secondary water temperature has exceeded the 2°C (4°F) below set point threshold (default). Alarm will cancel when temperature rises to 1°C (2°F) below set point or higher (this alarm will only activate when at or below dew point for a period of 3 minutes or more while in operating dew point tracking mode).
Action: Check operation of control valve(s).

Code: w27 – 'Secondary water high temp' (self clear)
Secondary water temperature has exceeded the 2°C (4°F) above set point threshold (default). Alarm will cancel when temperature falls to 1°C (2°F) above set point or lower (this alarm will activate at a pre-set default level of 20°C (70°F) while operating in dew point tracking mode – see Screen 6-3-12) (default 2 minute delay applies).
Action: Check operation of control valve(s). Check chilled water supply flow and temperature. Ensure data rack load does not exceed CDU cabinet capacity.

Code: w35 – 'Check Water Make-up Level' (engineer to clear)
Pressure at PS1 has dropped more than 0.2Bar (3PSI) below system minimum pressure setting while unit is running in automatic mode and fill pumps have been activated (default 10sec delay applies).
Action: Check amount of fluid in make-up container and re-fill if necessary. Check system for any sign of leakage.

Code: w37 – 'Sec over pressure' *[when set as a warning]* (engineer to clear)
Pressure at PS1 has increased above the set default value of 7.5Bar (105PSI).
***Note:** Can also be configured as an alarm (code **a32**) with unit shutdown.*
Action: Most likely cause will be excessive heat build up in the system or a breech between primary & secondary circuits within the plate heat exchanger. Check for high temp alarms, relieve pressure at drain point. Remove heat exchanger & replace.

Code: a38 – 'Primary water low flow' (engineer to clear)
Becomes active under the following conditions:- Valve demand is at 100% & Secondary High Temp alarm is active while Primary Temp is within limits (default 5 minute delay applies).
Action: Check that the chiller is operational and fault free.

Alarms

Alarms are more urgent events that are critical to the operation of the unit and will require immediate attention. The presence of these Alarms is identified on the controller fascia by a red flashing LED.
Note: Alarm titles shown in **Red** will initiate a unit shutdown.

Code: a01 – '635 board failure' (self clear)
Communications break between controller mother board & daughter board.
Action: Check connections between the boards.

Code: a02 – 'Primary temp out of range' (self clear)
Reading from primary temperature sensor T1 is outside the nominated range of -31°C to +66°C (-23.8°F to +150.8°F).
Action: Check sensor connections to the control board

TROUBLESHOOTING (continued).

Code: a03 – 'Sec temp T2a out of range' (self clear)

Reading from secondary temperature sensor T2a is outside the nominated range of -31°C to +66°C (-23.8°F to +150.8°F).

Action: Check sensor connections to the control board.

Code: a04 – 'Room temp out of range' (self clear)

Reading from room temperature sensor T3 is outside the nominated range of -31°C to +66°C (-23.8°F to +150.8°F).

Action: Check sensor connections to the control board.

Code: a05 – 'Sec pump LP out of range' (self clear)

Reading from pressure sensor PS1 is outside the nominated range of -1 to 8Bar (-14.4 to 116PSI).

Action: Check sensor connections to the control board.

Code: a06 – 'Sec pump HP out of range' (self clear)

Reading from pressure sensor PS2 is outside the nominated range of -1 to 8Bar (-14.4 to 116PSI).

Action: Check sensor connections to the control board.

Code: a07 – 'Prim LP out of range' (self clear)

Reading from pressure sensor PS4 is outside the nominated range of -1 to 8Bar (-14.4 to 116PSI).

Action: Check sensor connections to the control board.

Code: a08 – 'Prim HP out of range' (self clear)

Reading from pressure sensor PS3 is outside the nominated range of -1 to 8Bar (-14.4 to 116PSI).

Action: Check sensor connections to the control board.

Code: a10 – 'Insufficient water level' (engineer to clear)

Insufficient level in the reservoir after fill pump has been running for 3 minutes (in automatic mode).

Action: Check that filling wand is fully immersed in water container to pump into the system. Check the system for leaks.

Code: a11 – 'Pump P1 inverter fault' (engineer to clear)

Pump P1 is drawing excessive current, or inverter has been subjected to excessive voltage. Alarm will cancel when inverter receives a reset signal (controller will pulse a reset to inverter on new pump start signal after fault received).

Action: Force Pump 1 to run using 'Manual Control' function and measure current drawn by pump. If higher than setting in the inverter (see page 19), then pump should be replaced. If current is OK, then replace inverter drive unit.

Code: a12 – 'Pump P1 inverter low flow' (engineer to clear)

Pump P1 has not reached the correct differential pressure in the specified time limit via the inverter drive. Alarm will cancel when inverter receives a reset signal (controller will pulse a reset to inverter on new pump start signal after fault received) .

Action: Check unit has been set up for the correct number of racks. Check inverter drive for faults. Check non-return valves are not sticking open.

Code: a13 – 'Pump P2 inverter fault' (engineer to clear)

Pump P2 is drawing more than the over current setting in the inverter drive. Alarm will cancel when inverter receives a reset signal (controller will pulse a reset to inverter on new pump start signal after fault received).

Action: Force Pump 2 to run using 'Manual Control' function and measure current drawn by pump. If higher than inverter setting (see page 19), then pump should be replaced. If current is OK, then replace inverter drive unit.

TROUBLESHOOTING (continued)

Code: a14 – 'Pump P2 inverter low flow' (engineer to clear)

Pump P2 has not reached the correct differential pressure in the specified time limit via the inverter drive. Alarm will cancel when inverter receives a reset signal.

Action: Check unit has been set up for the correct number of racks. Check inverter drive for faults. Check non-return valves are not sticking open.

Code: a15 – 'Pump P1 DOL overload' (self clear)

Pump P1 is drawing more than thermal overload current setting when driven direct on line. Alarm will cancel when thermal relay is reset.

Action: Reset overload then, force Pump 1 to run using 'Manual Control' function and measure current drawn by pump. If higher than overload setting (see wiring diagram), then pump should be replaced.

Code: a16 – 'Pump P1 DOL low flow' (engineer to clear)

Pump P1 has not reached the correct differential pressure in the specified time limit when driven direct on line.

Action: Check unit has been set up for the correct number of racks. Check non-return valves are not sticking open.

Code: a17 – 'Pump P2 DOL overload' (self clear)

Pump P2 is drawing more than thermal overload current setting when driven direct on line. Alarm will cancel when thermal relay is reset.

Action: Reset overload, then force Pump 2 to run using 'Manual Control' function and measure current drawn by pump. If higher than overload setting (see wiring diagram), then pump should be replaced.

Code: a18 – 'Pump P2 DOL low flow' (engineer to clear)

Pump P2 has not reached the correct differential pressure in the specified time limit when driven direct on line.

Action: Check unit has been set up for the correct number of racks. Check non-return valves are not sticking open.

Code: a19 – 'Pump shutdown' (engineer to clear)

Unit has cycled through all pump control options after inverter & pump fault alarms, i.e. Pump 1 Inverter fault, Pump 2 Inverter fault, Pump 1 DOL fault, Pump 2 DOL fault. Unit will revert to Pump 1 Inverter when alarms are cleared.

Action: Check running current of pumps, check inverter for faults.

Code: a20 + a21 – 'Valve 1 & 2 fault' (engineer to clear)

Feedback signal from both valves is more than 10% adrift from demand signal - allowing for positioning time.

Action: As for **w20** & **w21** warnings.

Code: a28 – 'Flood unit' or 'Flood unit' *selectable - alarm or alarm + shutdown* (engineer to clear)

Level switch in cabinet drip tray has detected a substantial water leak.

Action: Identify and repair leak (Note: a leak of this magnitude that does not bring up any other alarms, will most likely be from the Primary circuit).

Code: a29 – 'Sec temp T2b out of range' (self clear)

Reading from secondary temperature sensor T2b is outside the nominated range of -31°C to +66°C (-23.8°F to +150.8°F).

Action: Check sensor connections to the control board.

Code: a30 – 'Sec temp diff error' (self clear)

Reading difference between secondary temperature sensors T2a and T2b is more than 1°C (2°F) for a period of 2 minutes or more.

Action: Check both sensors against temperature sensor resistance chart in **Section 8.2** and replace the faulty unit.

TROUBLESHOOTING (continued)

Code: a31 – 'Room RH out of range' (self clear)

Reading from room relative humidity sensor is outside the nominated range of 5% to 95% RH.

Action: Check sensor connections to the control board.

Code: a32 – 'Sec over pressure' *[when set as an alarm]* (engineer to clear)

Pressure at PS1 has increased above the set default value of 7.5Bar (105PSI).

***Note:** Can also be configured as a warning (code **w37**) only.*

Action: Most likely cause will be excessive heat build up in the system or a breech between primary & secondary circuits within the plate heat exchanger. Check for high temp alarms, relieve pressure at drain point. Remove heat exchanger & replace.

Code: a33 – 'EPO Shutdown'

Door Control Switch or EPO/Fire Shutdown in an open circuit condition.

Action: Check link connections from terminals 1 to 2 and 3 to 4, or check circuitry if these facilities have been wired in.

Code: a34 – 'Flood underfloor' or 'Flood underfloor' *selectable - alarm or alarm + shutdown* (engineer to clear)

Water detection tape installed under floor (if fitted – optional extra) has detected a substantial water leak.

Action: Identify and repair leak (Note: a leak of this magnitude that does not bring up any other alarms, will most likely be from the Primary circuit).

Code: a36 – 'Sec low pressure' (engineer to clear)

Pressure at PS1 has dropped to more than 0.2Bar (3PSI) below the fill pump activation threshold for more than 1 minute (applicable when unit is running in automatic mode).

Action: Check the make-up container is full, tubes are free of airlocks, container is properly connected and fill pumps are operational. Check system for leaks.

Code: a38 – 'Primary water no flow' (engineer to clear)

Becomes active under the following conditions:- Valve demand is at 100%, Secondary High Temp alarm is active and Primary High Temp alarm is active (default 5 minute delay applies).

Action: Check that the chiller is operational and fault free.

Other conditions (i.e. not a Warning or Alarm)

Communications error

Communications break between controller mother board & display board.

Action: Check connections between the boards.

No message displayed – unit not running/not responding to start signal

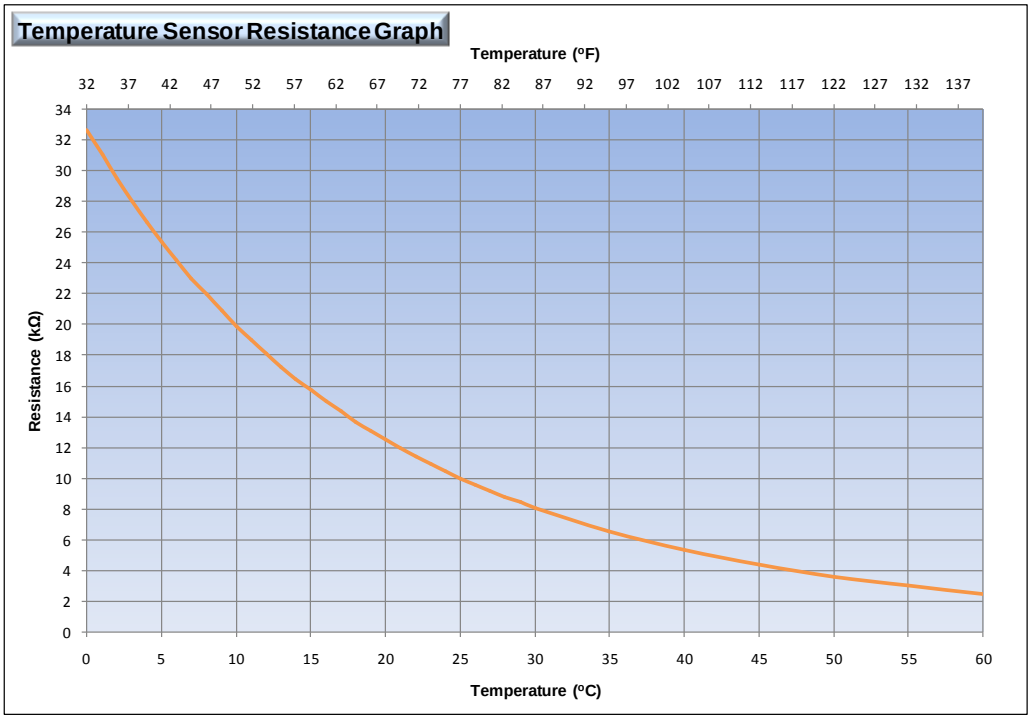
Power failure on controller mother board.

Action: Check that 24v is available on control motherboard – (review digital I/O status on Screen ref. 3-12, page 27). End digit on top line of digital inputs should be at '1'. If at '0', then the 24v supply failed. Switch power off, open electrical compartment & switch power back on, if there are no LEDs showing on mother board then check board fuse/24v supply. If LEDs are on, then check for wiring faults on Control Switch & EPO/Fire Shutdown circuits.

DANGER: This should only be carried out by a qualified electrician.

TROUBLESHOOTING (continued)

8.2 Temperature Sensor Chart



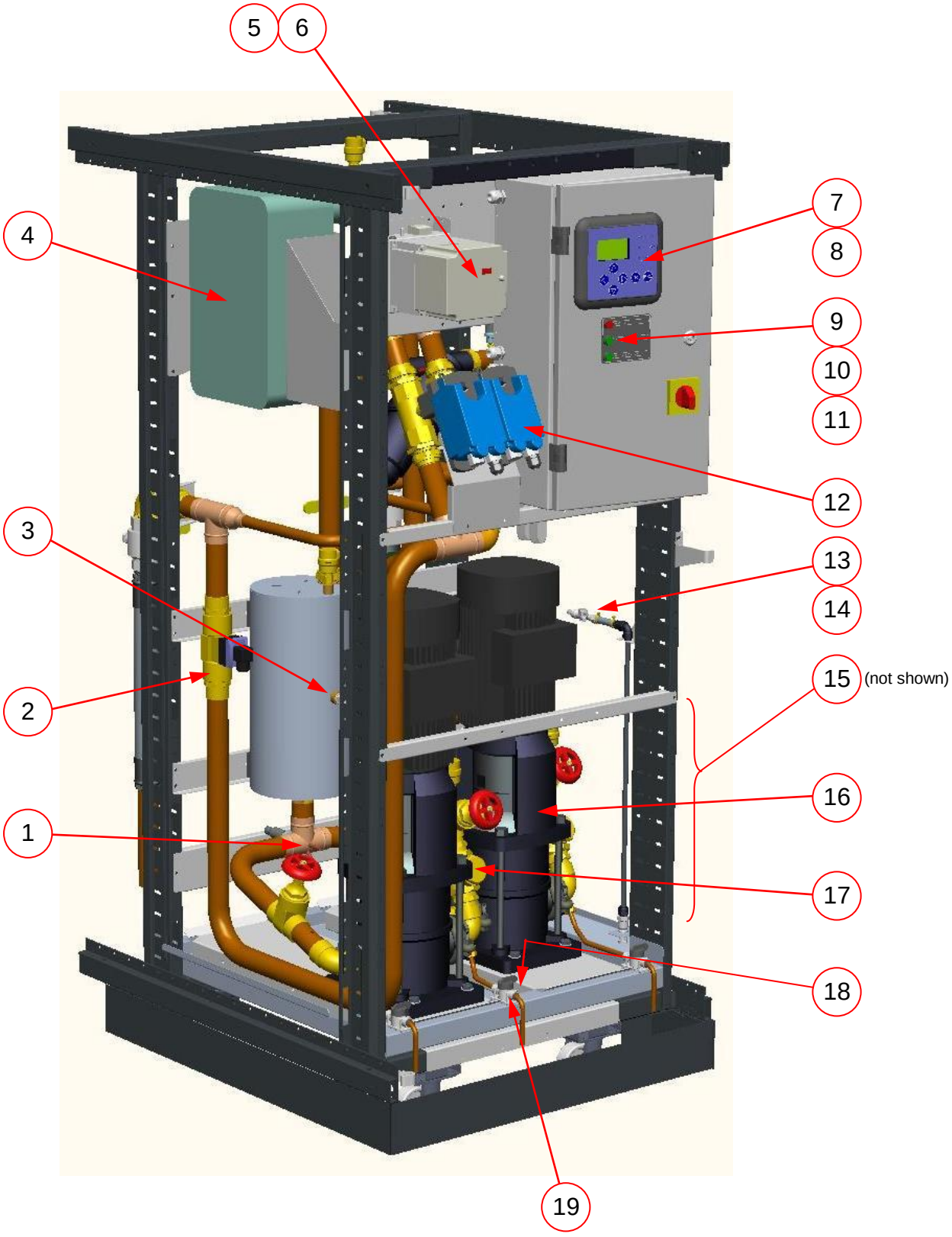
The chart above may be used to check the validity of any of the temperature sensors used in the unit or the remote room sensor.

SPARE PARTS

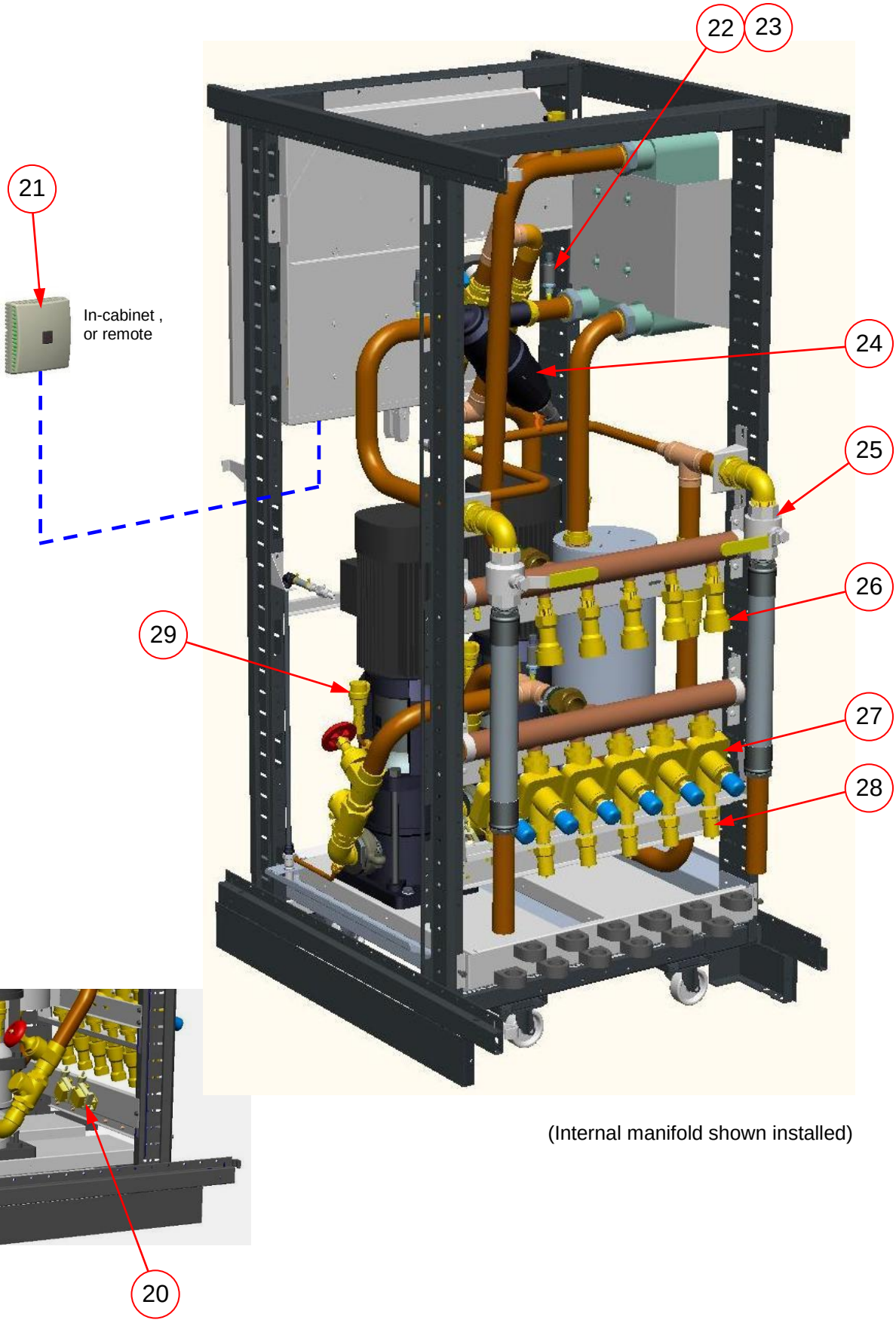
Section 9

ITEM	PART No.	DESCRIPTION
1	CDUS-001	Temperature Sensor
2	CDUS-040	Primary Flow Meter
3	CDUS-002	Float Switch (reservoir)
4	CDUS-018 CDUS-019	Plate Heat Exchanger (120kW) Plate Heat Exchanger (150kW)
5	CDUS-041 CDUS-042	Inverter Drive (380 – 480v) Inverter Drive (208 – 230v)
6	CDUS-068	Inverter Drive RFI Filter (200 – 480v)
7	CDUS-046	Controller Display
8	CDUS-047	Display Keypad
9	CDUS-003	Start / Stop Push Button
10	CDUS-004	Fill Pump Push Button
11	CDUS-005	Power On Lamp
12	CDUS-006	Primary Control Valve & Actuator
13	CDUS-010	Male Quick Release Coupling ⅜”
14	CDUS-012	Female Quick Release Coupling ⅜” P/M
15	CDUS-007	Flexible Make-up Container
16	CDUS-020	Main Pump
17	CDUS-048	Non-Return Swing Check Valve
18	CDUS-008	Float Switch (flood tray)
19	CDUS-049	Drain Valve
20	CDUS-009	Fill Pump
21	CDUS-050	Room Temp/Humidity Sensor
22	CDUS-065	Pressure Sensor
23	CDUS-075	Pressure Sensor Cable
24	CDUS-051	Primary Filter Screen
25	CDUS-052	Primary Isolation Ball Valve
26	CDUS-039	Female Quick Release Coupling ¾”
27	CDUS-053	Flow Balancing Valve
28	CDUS-038	Male Quick Release Coupling ¾”
29	CDUS-074	Automatic Air Vent
30	CDUS-054	Relay 12V DC
31	CDUS-076	Controller Assembly
32	CDUS-064	3.15A Fuse
33	CDUS-036	2A Fuse
34	CDUS-057 CDUS-058	Overload (380 – 480v) Overload (208 – 230v)
35	CDUS-060 CDUS-061	MCB 2-Pole 2A (380 – 480v) MCB 2-Pole 2A (208 – 230v)
36	CDUS-063	Transformer
37	CDUS-067	2.5A Fuse
38	CDUS-066	Contactor

SPARE PARTS (continued)

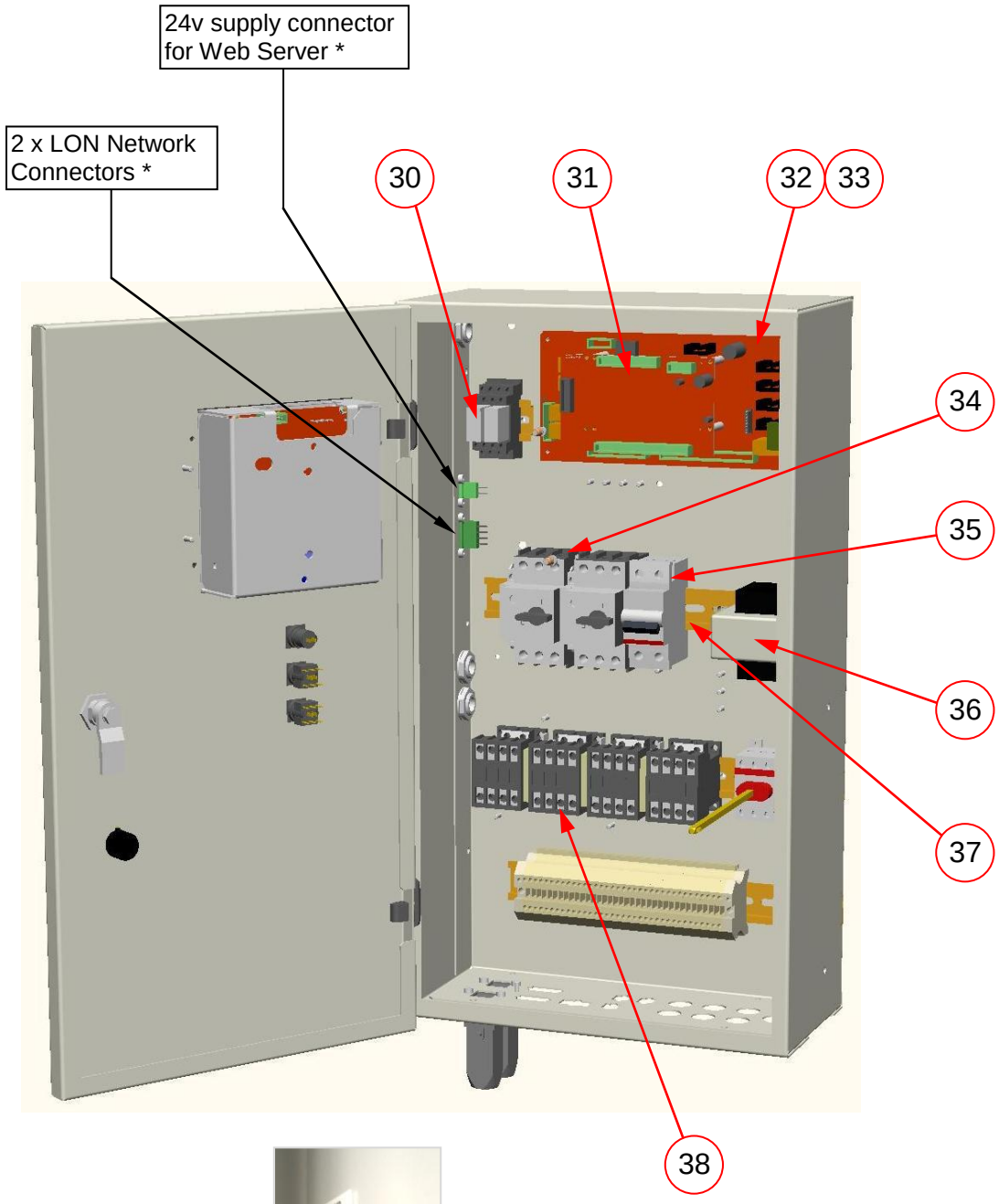


SPARE PARTS (continued)



(Internal manifold shown installed)

SPARE PARTS (continued)



* 24v Power supply connection & LON network connections viewed from outside the electrical panel

SCHEMATICS

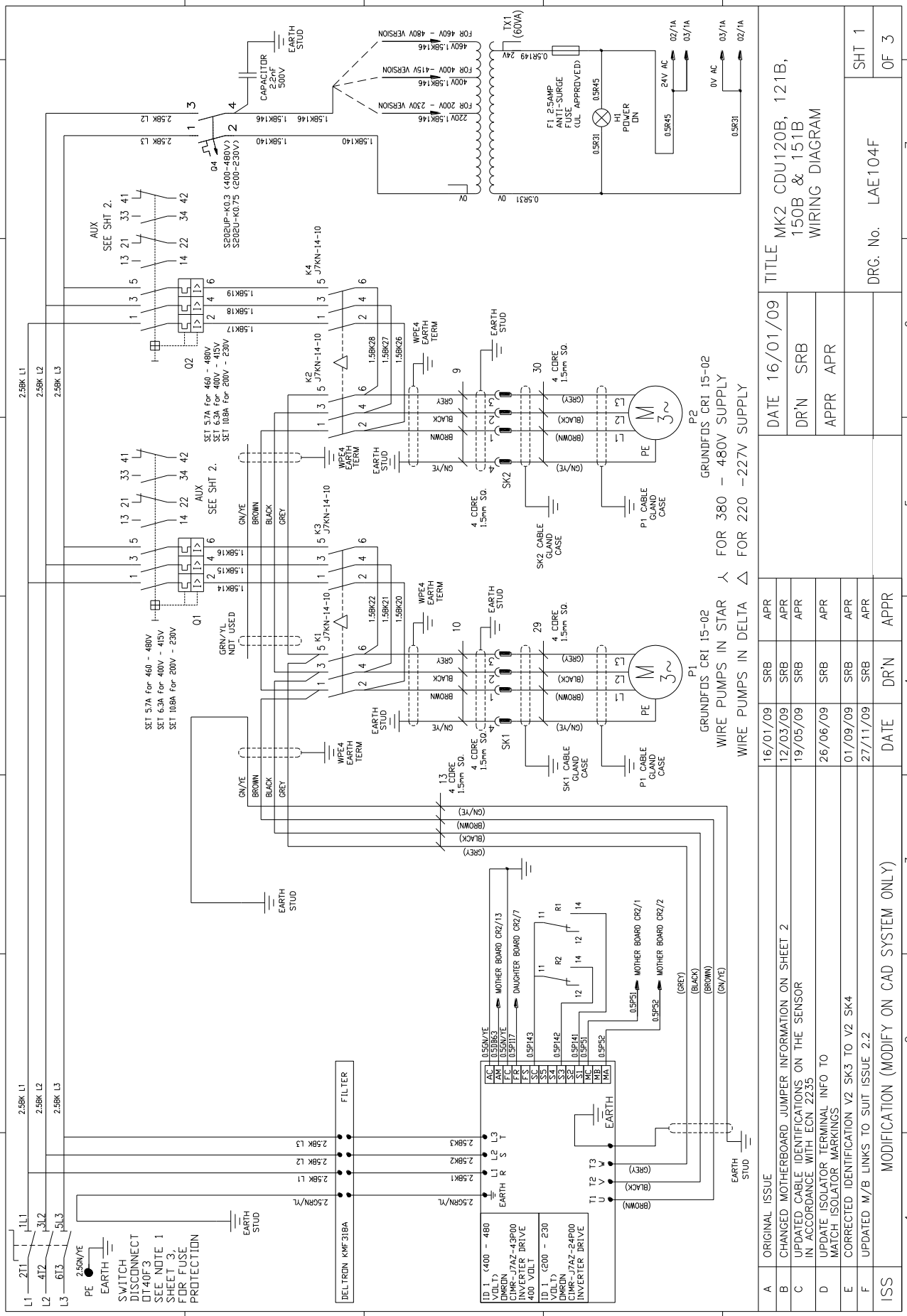
Section 10

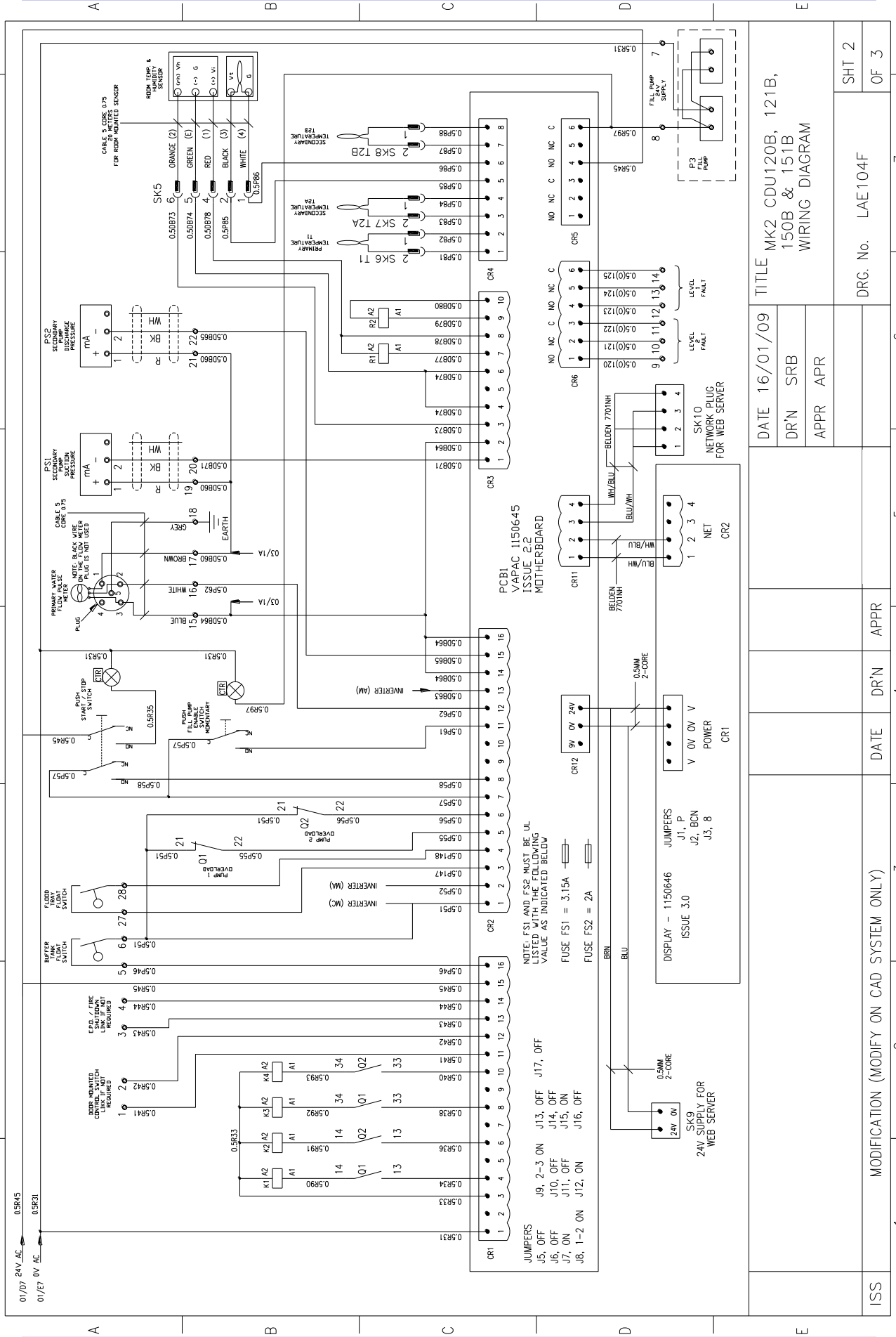
10.1 Wiring Diagram

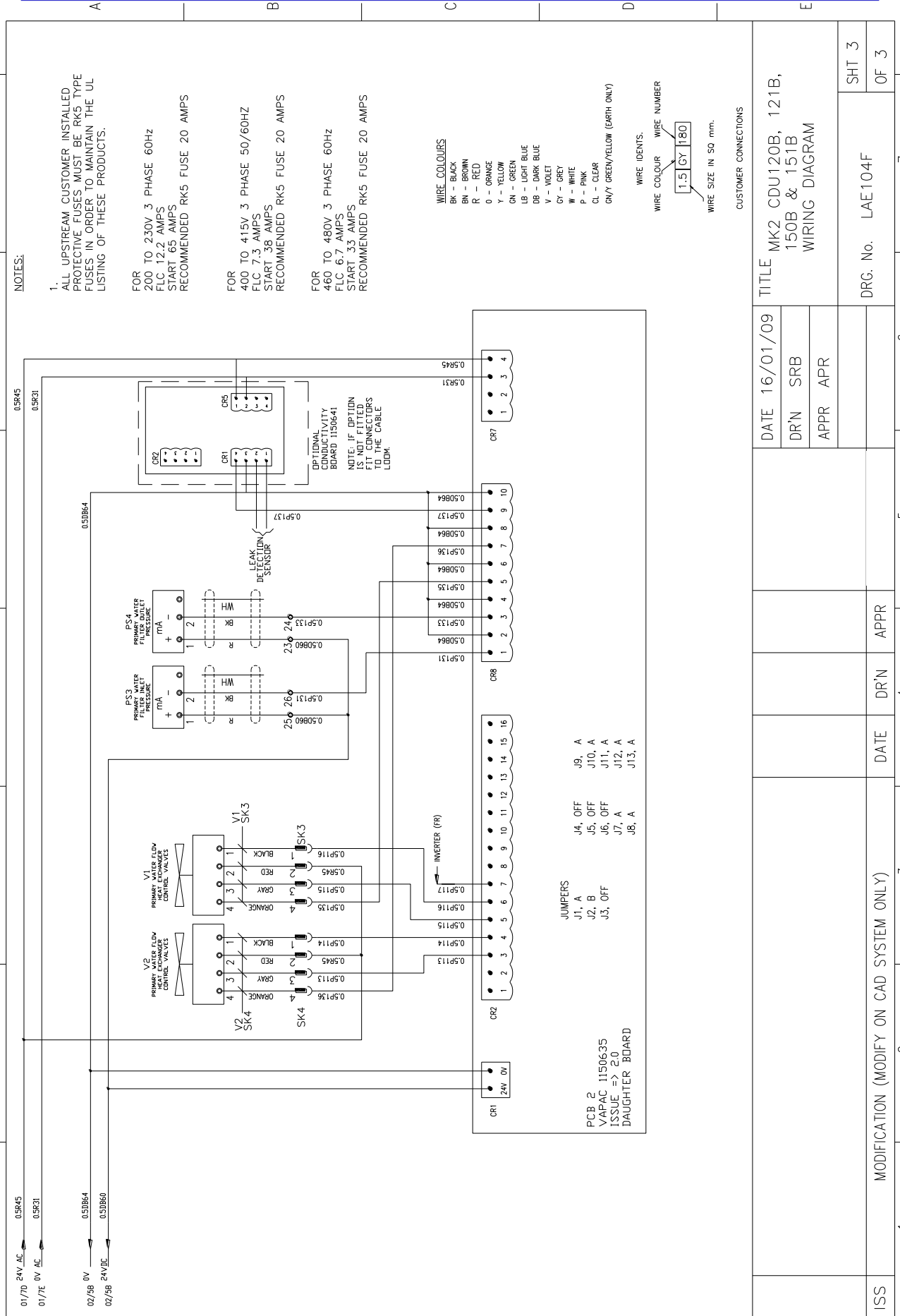
A3 LAE029

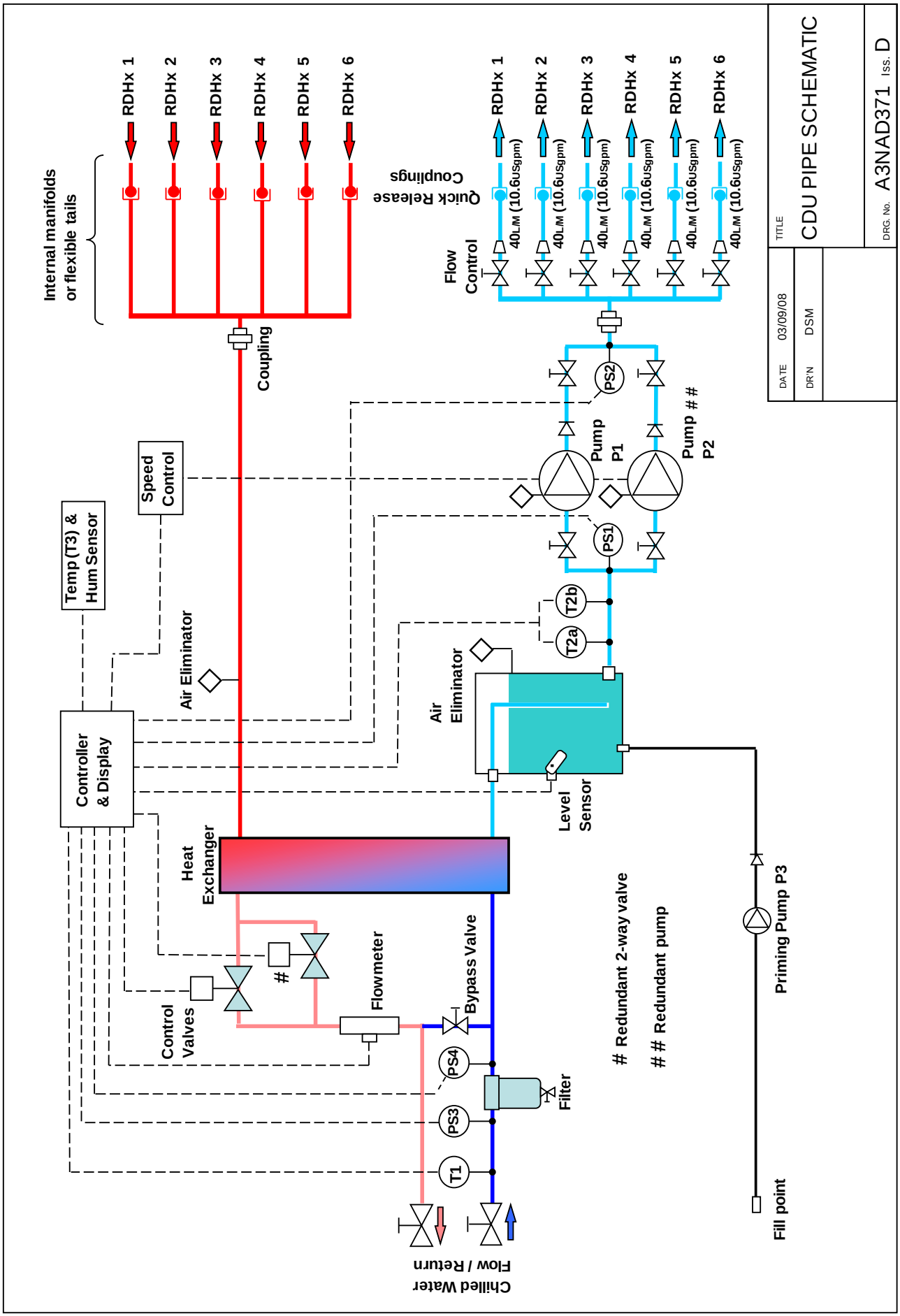
10.2 Pipe Schematic

A4 NAD371


TITLE MK2 CDU120B, 121B, 150B & 151B WIRING DIAGRAM
DRG. No. LAE104F
SHT 1 OF 3
DATE 16/01/09
DR'N SRB
APPR APR
GRUNDFOS CRI 15-02
WIRE PUMPS IN STAR ⅄ FOR 380 - 480V SUPPLY
WIRE PUMPS IN DELTA △ FOR 220 -227V SUPPLY
ISS
A ORIGINAL ISSUE 16/01/09 SRB APR
B CHANGED MOTHERBOARD JUMPER INFORMATION ON SHEET 2 12/03/09 SRB APR
C UPDATED CABLE IDENTIFICATIONS ON THE SENSOR IN ACCORDANCE WITH ECN 2235 19/05/09 SRB APR
D UPDATE ISOLATOR TERMINAL INFO TO MATCH ISOLATOR MARKINGS 26/06/09 SRB APR
E CORRECTED IDENTIFICATION V2 SK3 TO V2 SK4 01/09/09 SRB APR
F UPDATED M/B LINKS TO SUIT ISSUE 2.2 27/11/09 SRB APR
MODIFICATION (MODIFY ON CAD SYSTEM ONLY) DATE DR'N APPR


TITLE MK2 CDU120B, 121B, 150B & 151B WIRING DIAGRAM
DRG. No. LAE104F
SHT 2 OF 3
DATE 16/01/09
DR'N SRB
APPR APR
PCB1 VAPAC 1150645 ISSUE 2.2 MOTHERBOARD
CR1
CR2
CR3
CR4
CR5
CR6
CR11
CR12
SK5
SK6 T1
SK7 T2A
SK8 T2B
PS1 SECONDARY PUMP SUCTION PRESSURE
PS2 SECONDARY PUMP DISCHARGE PRESSURE
PRIMARY WATER FLOW PULSE METER
SK10 NETWORK PLUG FOR WEB SERVER
SK9 24V SUPPLY FOR WEB SERVER
P3 FILL PUMP
FILL PUMP 24V SUPPLY
DISPLAY - 1150646 ISSUE 3.0
JUMPERS J1, P J2, BCN J3, 8
POWER
NET
INVERTER (MA)
INVERTER (MC)
INVERTER (AM)
PUMP 1 OVERLOAD
PUMP 2 OVERLOAD
FLOOD PAN FLOAT SWITCH
BUFFER TANK FLOAT SWITCH
PUSH START/STOP SWITCH
PUSH FILL PUMP ENABLE SWITCH MOMENTARY
E.P.O. / FIRE SHUTDOWN LINK IF NOT REQUIRED
DOOR MOUNTED CONTROL SWITCH LINK IF NOT REQUIRED
ROOM TEMP. & HUMIDITY SENSOR
CABLE 5 CORE 0.75 20 METRES FOR ROOM MOUNTED SENSOR
CABLE 5 CORE 0.75
NOTE BLACK WIRE IN PLUG IS NOT USED
PLUG
EARTH
GREY
BROWN
WHITE
BLUE
ORANGE (2)
GREEN (E)
RED (1)
BLACK (3)
WHITE (4)
BELDEN 7701NH
WH/BLU
BLU/WH
0.5MM 2-CORE
NOTE: FS1 AND FS2 MUST BE UL LISTED WITH THE FOLLOWING VALUE AS INDICATED BELOW
FUSE FS1 = 3.15A
FUSE FS2 = 2A
JUMPERS
J5, OFF
J6, OFF
J7, ON
J8, 1-2 ON
J9, 2-3 ON
J10, OFF
J11, OFF
J12, ON
J13, OFF
J14, OFF
J15, ON
J16, OFF
J17, OFF
LEVEL 1 FAULT
LEVEL 2 FAULT
01/07 24V AC
01/E7 0V AC
0.5R45
0.5R31
ISS
MODIFICATION (MODIFY ON CAD SYSTEM ONLY)
DATE
DR'N
APPR


NOTES:
1.
ALL UPSTREAM CUSTOMER INSTALLED PROTECTIVE FUSES MUST BE RK5 TYPE FUSES IN ORDER TO MAINTAIN THE UL LISTING OF THESE PRODUCTS.
FOR
200 TO 230V 3 PHASE 60Hz
FLC 12.2 AMPS
START 65 AMPS
RECOMMENDED RK5 FUSE 20 AMPS
FOR
400 TO 415V 3 PHASE 50/60HZ
FLC 7.3 AMPS
START 38 AMPS
RECOMMENDED RK5 FUSE 20 AMPS
FOR
460 TO 480V 3 PHASE 60Hz
FLC 6.7 AMPS
START 33 AMPS
RECOMMENDED RK5 FUSE 20 AMPS
WIRE COLOURS
BK - BLACK
BN - BROWN
R - RED
O - ORANGE
Y - YELLOW
GN - GREEN
LB - LIGHT BLUE
DB - DARK BLUE
V - VIOLET
GY - GREY
W - WHITE
P - PINK
CL - CLEAR
GN/Y GREEN/YELLOW (EARTH ONLY)
WIRE IDENTS.
WIRE COLOUR WIRE NUMBER
1.5 GY 180
WIRE SIZE IN SQ mm.
CUSTOMER CONNECTIONS
TITLE MK2 CDU120B, 121B, 150B & 151B WIRING DIAGRAM
DRG. No. LAE104F
SHT 3
OF 3
DATE 16/01/09
DR'N SRB
APPR APR
ISS
MODIFICATION (MODIFY ON CAD SYSTEM ONLY)
DATE
DR'N
APPR
PCB 2
VAPAC 1150635
ISSUE => 2.0
DAUGHTER BOARD
JUMPERS
J1, A
J2, B
J3, OFF
J4, OFF
J5, OFF
J6, OFF
J7, A
J8, A
J9, A
J10, A
J11, A
J12, A
J13, A
INVERTER (FR)
CR1
CR2
CR5
CR7
CR8
SK3
SK4
V1
V2
PS3
PS4
LEAK DETECTION SENSOR
OPTIONAL CONDUCTIVITY BOARD 1150641
NOTE: IF OPTION IS NOT FITTED FIT CONNECTORS TO THE CABLE LOOM.
PRIMARY VALVE FLOW HEAT EXCHANGER CONTROL VALVES
PRIMARY WATER FILTER INLET PRESSURE
PRIMARY WATER FILTER OUTLET PRESSURE
BLACK
RED
GRAY
ORANGE
24V AC
0V AC
0V
24VDC
24V
0V


RDHx 1
RDHx 2
RDHx 3
RDHx 4
RDHx 5
RDHx 6
Internal manifolds or flexible tails
Quick Release Couplings
40L/M (10.6USgpm)
Flow Control
Coupling
PS2
Pump P1
Pump # # P2
PS1
Speed Control
Temp (T3) & Hum Sensor
T2b
T2a
Air Eliminator
Air Eliminator
Controller & Display
Level Sensor
Heat Exchanger
Priming Pump P3
Redundant 2-way valve
Redundant pump
Flowmeter
Bypass Valve
Control Valves
PS4
Filter
PS3
T1
Fill point
Chilled Water Flow / Return
TITLE
CDU PIPE SCHEMATIC
DRG. No. A3NAD371 ISS. D
DATE 03/09/08
DR'N DSM

WARRANTY & SUPPORT

Section 11

To obtain service, technical assistance or warranty information, please contact:

Technical Support and Service

To obtain technical support or service please contact Coolcentric directly at:

Toll-free (US/Canada): **+1-877-248-3883**
DDI: **+1-508-203-4690**
Email: **info@coolcentric.com**

Limited Product and Service Warranty

To obtain a copy of Coolcentric's Limited Product and Service Warranty:

Toll-free (US/Canada): **+1-877-248-3883**
DDI: **+1-508-203-4690**
Visit: **www.coolcentric.com\information\documentation\warranty**

Notes:

Disposals Procedure

NOTE: All waste materials must be disposed of in a professional and responsible manner in strict adherence to environmental regulations.

The de-commissioning, dismantling and disposal of Cooling Distribution Units should only be undertaken by experienced personnel with full adherence to all safety rules, in particular protection of lungs, eyes and skin from chemicals, dust etc. Only approved lifting gear and power tools should be used and access to the work area restricted to authorised personnel.

1. Disconnect unit from electrical supply.

2. Drain and dispose of any heat transfer fluid through an approved recycling facility.

3. Remove unit to approved recycling facilities only.